Dual

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Service Manual C 839 RC

Dual Gebrüder Steidinger · 7742 St. Georgen/Schwarzwald

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Technical data (typical values)

The unit exceeds the requirements of DIN 45 500 for domestic HiFi equipment.

Tape speed		4.75 cm/s
Pitch	Control range	± 4 %
Flutter and wow		
W.R.M.S.		± 0.03 %
to DIN, playback only		± 0.06 %
to DIN, recording/playback		± 0.09 %
Frequency response (referring to DIN tolerances)		
Standard Fe tape		30 – 18 000 Hz
CrO_2 tape		30 – 19 000 Hz
FeCr tape		30 – 19 000 Hz
Pure metal tape		30 – 20 000 Hz
Signal-to-noise ratio (with Dolby NR)		
Fe		64 dB
CrO_2		64 dB
FeCr		67 dB
Met		67 dB

Channel separation at 1000 Hz	
between stereo channels	35 dB
between channels in opposite direction	60 dB
Erasure at 1000 Hz	70 dB
Oscillator frequency (push/pull oscillator)	105 kHz
Inputs (sensitivity at 0 dB)	
Microphone (1/4" coax jack)	0.25 mV/10 kOhm
Receiver/amplifier (DIN jack)	0.5 mV/ 6.3 kOhm
Receiver/amplifier (RCA jacks)	40 mV/82 kOhm
Outputs (adjustable)	
Receiver/amplifier (DIN jack)	0 – 580 mV/10 kOhm
Receiver/amplifier (RCA jacks)	0 – 580 mV/ 2 kOhm
Headphones (1/4" coax jack)	4 – 2000 Ohm
Fast wind time for C 60 cassette	65 sec.
Line voltage	115 volt and 230 volt
Line frequency	50/60 Hz
Power consumption	40 W

Functional description AF section

Playback

The voltage from the magnetic head (approximately 300 μV when playing back the DIN reference level) is amplified by low-noise transistor T 4010. L 4002 in the base circuit serves as an RF trap. During operation with fade-edit, no stray RF signals should reach the playback amplifier. The playback amplifier is formed by IC 4003. Equalisation is performed by negative feedback network R 4088, C 4034, R 4049 and C 4033 constant at 70 μs. When switch S 5 is in position 1 or 2, R 4087 and C 4035 are connected via diode D 4010. The time-constant increases by 50 μs so that 120 μs are now available.
The playback level when playing back the Dolby reference level is set for each magnetic head with the aid of trimmers R 4052 and R 4054. This setting ensures that the Dolby processor functions perfectly. The Dolby unit is a self-aligned component. L 4201 (for filtering the high frequency) and L 4202 (alignment to 19 kHz) must not be adjusted. (This is carried out at the factory). The output signal (Stp. 3) is supplied to the output jacks, the display amplifier and headphone amplifier via relay contact. The maximum output level of 580 mV may be reduced by means of trimmer R 4035.

Muting circuit

In order to prevent starting and switching noises from reaching the output jacks, the device is provided with two separate muting circuits. When the unit is switched on, capacitor C 4052 ensures that transistor T 4006 remains blocked until the voltage is increased. The reed relay does not respond.

1.) When the unit is in normal condition, a high signal is applied to the output of the muting circuit. This signal is applied to the base of T 4007 which drives, blocking T 4006. The relay is unable to operate. Simultaneously, the muting signal is applied to the base of the limiter transistor T 4003 via D 4020 and R 4055. Transistor T 4003 drives, applying the input signal to 0 V. When the capstan motor is started either anticlockwise or clockwise, the high pulses are switched to the NAND gart (IC 4006) by the motor electronic system. The output of the muting circuit goes to low after a time-lag of approximately 1 second (C 4026 or C 4063), thereby releasing the muting function. When the motor is started or the direction is reversed, the muting circuit remains operational until a constant speed is reached. The RF generator is also blocked by the muting signal (high) (Stp. A 7).

2.) If switch S 1 is in record position (sections 8 and 9), transistor T 4008 becomes conductive in the forward direction and 0 V is applied to the DIN output via R 4039.

Recording

Three different sources are available for recording (Mic, Line, Din). The Mic-signal is amplified by low-noise transistor T 4000 and is supplied to IC 4002 for the purposes of impedance conversion. The DIN signal (current supply complying with DIN 45 511; 0.1 – 2 μA) is amplified by IC 4000 and supplies excellent noise values.
The Line-signal reaches the input selector switch S 4 via IC 4001 (impedance transformer). Depending upon the switch position, the input signals reach the mixing amplifier formed by T 4001 and T 4002 via modulation regulators R 4020 (Line) and R 4008 (Mic). Transistor T 4013 serves to filter the +12 V. From the mixing stage, the AF signal is supplied to the limiter (T 4003 and T 4004) via R 4026. When the limiter is switched on, the level is limited at 30 mV.
The signal reaches the input of the Dolby unit (section 9) via the record/playback switch S 1. In position "h" switch S 7 (MPX/Dolby) connects +12 V to point 1, thereby rendering the Dolby circuit inactive. In position "g" (S 7), the MPX filter is switched on (suppression of pilot frequency). C 4025 is coupled to 0 V via the bilateral switch (13). Transistor T 4005 becomes biased in the forward direction and the bilateral switch (5) opens, isolating the connection between points 8 and 7 on the Dolby unit. The LED display D 4301 is activated by switch S 7.
With the Dolby circuit, the AF signal branches to two outputs.

The signal which has not been influenced by the Dolby processor is available at point 5 for monitoring purposes. It is supplied to the Line-output, the display amplifier and the headphone amplifier via switch S 1. The dolbyised signal is supplied to the record amplifier via the output (point 3). Transistor T 4014 is blocked. If, however, switch S 1 is positioned to play position, T 4014 becomes biased in the forward direction, biasing the record signal with 0 V. The record level for each magnetic head is set separately with trimmers R 4062 and R 4064. The record amplifier is constituted by IC 4004. L 4001 is aligned at the factory (resonating at 18.5 kHz) and must not be adjusted. With the aid of switch S 5 (tape selector), equalisation is matched to the particular type of tape by transistor T 4011 and sensitivity is matched by T 4012. The record signal is supplied to the magnetic head via the track selector switch S 2 after having previously been set to RF voltage minimum via the RF wave trap with L 4000.

RF generator

The RF generator is a push-pull oscillator with a frequency of approximately 105 kHz. The RF for the erased heads is tapped via L 4001 and biasing for the particular magnetic head is set by means of R 4082 and R 4084. The oscillator is influenced via switch S 5 and transistor T 4102 in such a way that, depending on the position of the tape selector switch S 5, the optimum operating point is achieved. A high signal at the base of T 4104 effectively biases transistor T 4103 in the reverse direction, blocking the generator. If a high signal is applied to the input E 2 (record mode), transistor T 4105 become biased in the forward direction, the base of T 4104 becomes low, T 4104 becomes biased in the forward direction, switching on the generator. A high signal at the output E 1 (music cassette) effectively biases T 4104 in the reverse direction, having the same effect as the high muting signal via imput A 7. Capacitor C 4104 in the base circuit of T 4103 ensures that the oscillator starts up smoothly and with no click.

Fade Edit

Low is applied to the base of T 4104 via input D by switches S 9 and S 10. The transistor becomes biased in the forward direction, releasing the generator.

When capacitor C 4301 discharges via switch S 10 to the base of T 4103, this transistor slowly becomes biased in the forward direction and the generator slowly starts to operate (fade-out procedure).

Display and limiter

Both during record and playback, the AF signal reaches the display amplifier formed by IC 4100. In order to allow for increased saturation at high frequencies, frequency correction is carried out by means of S 5. Boosting by 400 Hz at 10 kHz results in approximately 10 dB. The display is comprised of a 12-stage LED chain, driven by IC 4301. The control signal for IC 4301 is tapped at the output of the display amplifier and the level is set to 0 dB during playback of the reference level with R 4127. The control signal is rectified by D 4316, C 4302 ensures damped return (approximately 0.5 s) of the LED display. The –20 dB mark is set by means of R 4303. The inertialess display may be switched off by switch S 11.

Zero of the limiter operating range is set by means of R 4121. The control signal is amplified by transistor T 4106 and is supplied to the base of T 4004 via switch S 6 (limiter). T 4004, in turn, drives transistor T 4003 which acts as a differential resistance, forming a voltage divider together with R 4026. The settling time (approximately 3 – 5 s) of the limiter after it has responded is formed by means of C 4115. Limiter transistor T 4003 is used to mute the input signal. This is performed by applying a high signal to the base when the following functions are operative:switch S 1 in position (play) and in the case of all muting functions.

Headphone amplifier

The unit is provided with a separate headphone amplifier (IC 4101). Headphones with an impedance of between 4 and 2000 ohms may be connected. An incorporated volume control facility for each channel (R 4128) permits the volume to be matched independently of the output signal.

Control

All functions of the unit and drive mechanism are controlled by a processor. By connecting a separate infrared receiver RE 120 and using the infrared transmitter RC 152, all functions of the unit may be remotely controlled. If connected to amplifier CV 1500 RC, RE 120 may be dispensed with. The infrared commands, converted into electrical pulses, are switched to a bus line via an infrared evaluation circuit. The bus line is then processed by the processor. The processor takes over the following tasks:

1. Scanning the pulse train
2. Filtering out interference
3. Identifying device-specific commands
4. Executing the command which has been identified.

The processor is accomodated in a separate assembly. The L-plug forms the interface between the processor and the subsequent device electronic system. The levels may be checked at plug L by means of the status matrix.

Inputs

All locally controlled functions and keys issue their information as active low. The contacts record lock ◁ and record lock ▷ (music cassette inserted = contacts open) issue their information as a high signal to two series-connected 8-bit shift registers IC 4503 and IC 4504. The data is then supplied serially to the processor via plug L 3. The shift clock pulse is issued via L 2 and switchover from parallel to serial input is issued by the processor at L 8. The signal "rewind motor stopped or operating" is input as a serial input to the shift register IC 4505, pin 11. The pulsating voltage at the emitter of T 4518 is converted by the circuitry, consisting of transistor T 4524 and T 4525, into a logic, static signal. Low = rewind motor operating and high = rewind motor stop. The contact, cassette sensor closed = cassette inserted, is arranged in series with the DLLS contacts. Contact closed = DLLS not actuated = DLLS off. This signal is scanned by the processor via plug L 7 directly (low). The infrared signals of the bus line are applied to plug L 9.

Outputs

The data for the LED displays are issued serially by the processor via plug L 2 to two 4-bit shift registers (IC 4505 pin 7). The relevant shift pulse is applied to pins 1 and 9 from L 1. The signals which are now applied in parallel are applied to an 8-segment constant current driver IC 4506 which drives the individual LED's. The LED register acknowledges a music cassette in the form of a low signal at transistor T 4526 via pin 5. This transistor T 4526 via pin 5. This transistor becomes biased in the reverse direction, blocking the RF generator with its high level at the collector via plug T 2.

The capstan motor is a dc rotor which is maintained at constant speed by means of a speed regulator IC 4501. A generator is located in one of the two capstan flywheels. The pulses which it generates, proportionate to the speed, are amplified by transistor T 4500 and supplied to IC 4501 at pin 3. Via the analog circuit IC 4500 8/9, R 4506 and trimmer R 4505 form a voltage divider between pins 11 and 5 of IC 4501 together with trimmer R 4503 and R 4504. The set speed during playback mode is set by means of R 4505 and, during record mode, by means of R 4503. It is imperative that its sequence be observed. A high signal at plug L 13 (record) in conjunction with the service plug being in position N, means that the analog switch 4/3 operates, applying 0 V to switch 10/11. This switch opens and the pitch control at plug point K 1 and K 2 is isolated from the voltage divider. This guarantees that, during record, absolute tape speed is maintained even if the pitch control is adjusted. The high record signal also reaches plug 1 in order to start the RF generator and plug R 8 in order to maintain the magnet record in hold condition.

The dc voltage is alternately connected to the motor by means of the H circuit, formed by transistors T 4504, T 4506, T 4505 and T 4507. A high signal at plug L 12 (capstan motor clockwise) causes transistor T 4503 to become biased in the forward direction, applying a high signal to the base of T 4507, applying 0 V to the motor and biasing the PNP transistor T 4504 in the forward direction. This applies the positive voltage to the motor. Transistor T 4502 readjusts the operating current on the basis of the switching pulses issued by the speed regulator IC 4501.

The rewind motor, comprising a dc rotor, is operated in two directions and at two speeds. Once again, an H circuit consisting of switching transistors T 4515, T 4521, T 4517 and T 4522 are central to reversing the direction of rotation. A constant current source supplies the operating current by means of transistor T 4518. A high signal at the base of T 4512 causes it to be biased in the forward direction. The high signal reaches the base of T 4520 which now couples the constant current source to the H circuit. When the direction is fed in, the motor operates in fast mode. On the other hand, If transistor T 4511 becomes conductive owing to a high signal, (command: rewind motor slowly), transistor T 4514 becomes biased in the forward direction, decreasing the operating current supplied by the constant current source via R 4534. The motor now operates in slow mode and tape tension is set by means of trimmer R 4524. The direction of rotation is preset by connecting transistors T 4513 (wind motor left) and T 4519 (wind motor right). Transistors T 4523 and T 4516 serve to delay connection.

When transistor T 4511 (wind motor slowly) is activated, T 4510 becomes biased in the forward direction and the solenoid "play" (in the drive system) located in the collector circuit thereby responds. A high signal at the base of T 4509 causes the solenoid "pause" (in the drive system) to respond via T 4508.

The solenoid drivers are also driven by high signals via plug R 7 for solenoid track ▷ and R 6 for solenoid track ◁. Solenoid record requires two operator commands. A high signal at plug R 5 applies −12 V to the solenoids. When there is a high signal at plug R 8 (solenoid record hold), the +12 V are applied causing the solenoid to respond rapidly. When the signal at R 5 (solenoid operative) is removed, the record solenoid remains at hold status via diode D 4415 with 0 V applied.

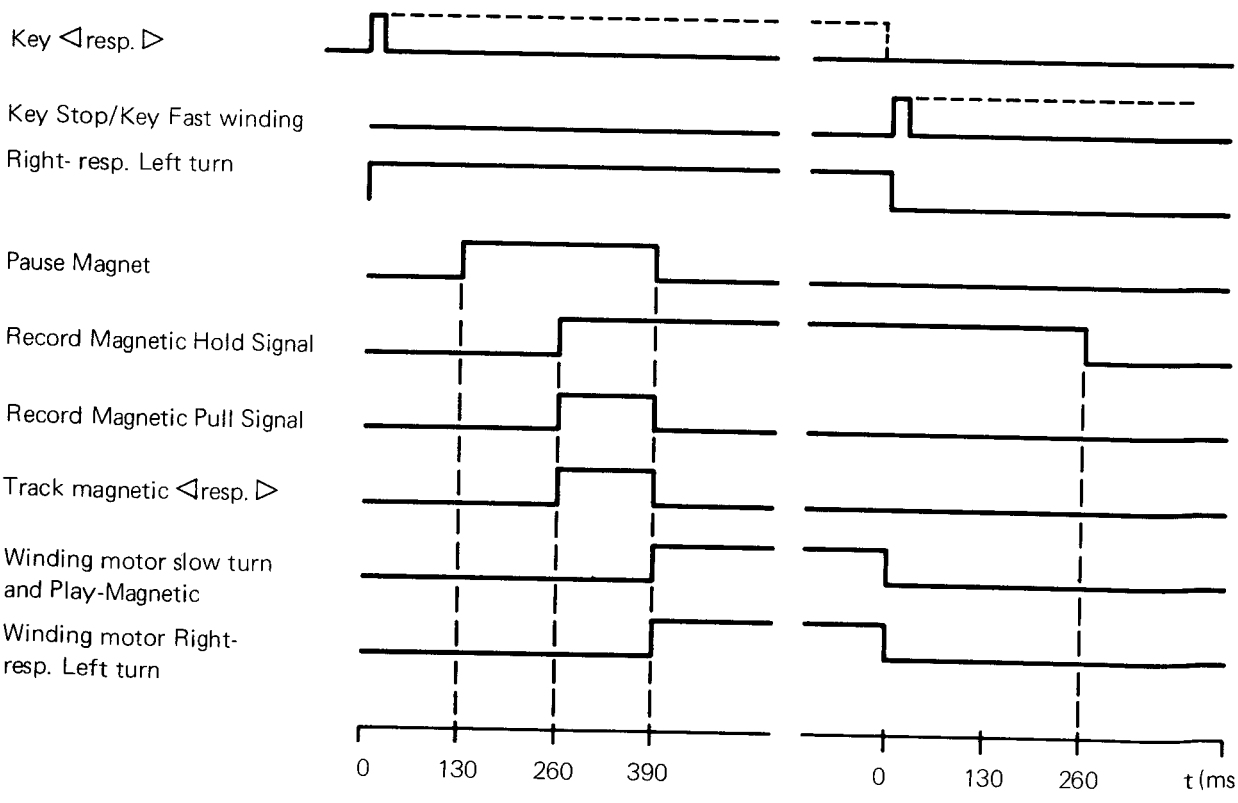
Level state matrix for unit control

↑ Data high-aktiv
↓ Data low-aktiv
● high ≦ + 12 V
– low ≙ 0 V
⊓ high Puls (≦ + 12 V) for certain time

State Number / Unit State	Checkpoint on plug L / Checkpoint on plug E	1 Puls LED Register	2 Puls Input/Data LED Reg.	3 Data Input	4 + 5 V	5 0 V	6 – 12 V	7 DLLS (+5 V)	8 P/S switch over	9 IR-Signal (+5 V)	10 TM-left turn ▽	11 WM-slow turn	12 TM-right turn △	13 Magnet Record Hold	14 Magnet Record Pull	15 Magnet Pause	16 + 12 V	17 Magnetic track △	18 Magnetic track ▽	19 WM-Fast turn	20 WM-Left turn ▽	21 WM-Right turn △	> AF-Generator 1	> AF-Generator 2
1	Stop	–	↑	↓				–	↑	●	–	–	–	–	–	–		–	–	–	–	–	●	–
3	Play▷	↑	↑	↓				–	↑	●	–	●	●	–	–	⊓		⊓	–	–	–	●	●	–
3	Play▷ + Recordblock▷	↑	↑	↓				–	↑	●	–	●	●	–	–	⊓		⊓	–	–	–	●	●	–
10	Play▷ + Pause	↑	↑	↓				–	↑	●	–	–	●	–	–	●		⊓	–	–	–	●	–	–
2	Play◁	↑	↑	↓				–	↑	●	●	●	–	–	–	⊓		–	⊓	–	●	–	–	–
2	Play◁ + Recordblock◁	↑	↑	↓				–	↑	●	●	●	–	–	–	⊓		–	⊓	–	●	–	●	–
9	Play◁ + Pause	↑	↑	↓				–	↑	●	●	–	–	–	–	●		–	⊓	–	●	–	–	–
5	Record▷	↑	↑	↓				–	↑	●	–	●	●	●	⊓	⊓		⊓	–	–	–	●	–	●
12	Record▷ + Pause	↑	↑	↓				–	↑	●	–	–	●	●	⊓	●		⊓	–	–	–	●	–	●
4	Record◁	↑	↑	↓				–	↑	●	●	●	–	●	⊓	⊓		–	⊓	–	●	–	–	●
11	Record◁ + Pause	↑	↑	↓				–	↑	●	●	–	–	●	⊓	●		–	⊓	–	●	–	–	●
7	FAST WINDING ◁◁	↑	↑	↓				–	↑	●	–	–	–	–	–	–		–	–	●		●	●	–
6	FAST WINDING ▷▷	↑	↑	↓				–	↑	●	–	–	–	–	–	–		–	–	●	●	–	●	–
14	DLLS on (Cassette removed)	↑	↑	↓				●	↑	●	–	–	–	–	–	–		–	–	–	–	–	●	–

Record and Recordblock (with music rec. cassette) = Play + Recordblock
When DLLS on (Cassette removed) the contacts „record blocked" ◁and ▷are operating.

Time graphic for unit control



Function status matrix

The matrix is designed to represent the device statuses and device functions possible by means of manual input or automatic operation. The specific device statuses are numbered (status number). The changed status is indicated each time a separate operation function is changed.
Example: The device is operating in rapid wind mode ◁◁, this corresponds to status number 6. The device should then be changed to play status ▷ by means of the controls on the unit. You should then check the operating panel on the unit in the section play ▷ . The point of intersection of this vertical line with the horizontal status number line (number 6) indicates the new status, which, in this case number 3, signifies play ▷. In order to check the AF recording current, the AF voltage may be measured at test point 1 or test point 1' via a filter.

State and Funktion List

OPERATING OF UNIT

STATE NUMBER	UNIT STATE	DIRECTOMATIC	LED DISPLAY: STOP	PLAY ▽	PLAY △	RECORD	FAST WINDING ▽▽	FAST WINDING △△	PAUSE	CLOSE CONTROL: STOP	PLAY ▽	PLAY △	RECORD ▽	RECORD △	REC. ◁ + REC. BLOCK ▽ △	REC. ▷ + REC. BLOCK ▽ △	FAST WINDING ▽ ▽	FAST WINDING △ △	PAUSE	DIRECTOMATIC ON	DIRECTOMATIC OFF	REMOTE CONTROL: STOP	PLAY ▽	PLAY △	FAST WINDING ▽ ▽	FAST WINDING △ △	PAUSE	MASTER OFF	AUTOMATIC CONTROL: TAPE END ↓↑	TAPE END + REC. BLOCK ▽	TAPE END + REC. BLOCK ▽ △	MEMORY: MEMORY OFF	MEMORY ON	MEMORY PLAY	TIMER: TIMER OFF	TIMER PLAY △	TIMER REC △	TAPE END
1	STOP		●							1	2	3	4	5	2	3	6	7	8	14	1	2	3	6	7	8	1	–	–	–	–	–	–	–	–	–			
2	PLAY ◁			●						1	2	3	2	5	2	3	6	7	9	15	1	2	3	6	7	9	1	1	1	1	3	3	3	–	–	–			
3	PLAY ▷				●					1	2	3	4	3	2	3	6	7	10	16	1	2	3	6	7	10	1	1	2	2	2	2	2	–	–	–			
4	RECORD ◁			●		●				1	4	3	4	5		3	6	7	11	15	1	4	3	6	7	11	1	1	1		5		3	–	–	–			
5	RECORD ▷				●	●				1	2	5	4	5	2		6	7	12	16	1	2	5	6	7	12	1	1	4	2	4	2		–	–	–			
6	FAST WINDING ◁◁						●			1	2	3	4	5	2	3	6	7	6	17	1	2	3	6	7	6	1							6	1	3			1
7	FAST WINDING ▷▷							●		1	2	3	4	5	2	3	6	7	7	18	1	2	3	6	7	7	1							7	1	2			1
8	PAUSE								●	1	9	10	11	12	9	10	6	7	1	19	1	9	10	6	7	1	1												
9	PLAY ◁ + PAUSE		●						●	1	9	10	11	12	9	10	6	7	2	20	1	9	10	6	7	2	1										–	–	
10	PLAY ▷ + PAUSE			●					●	1	9	10	11	12	9	10	6	7	3	21	1	9	10	6	7	3	1										–	–	
11	RECORD ◁ + PAUSE		●			●			●	1	11	10	11	12		10	6	7	4	20	1	11	10	6	7	4	1										–	–	
12	RECORD ▷ + PAUSE				●	●			●	1	9	12	11	12	9		6	7	5	21	1	9	12	6	7	5	1										–	–	
13	POWER ON																																				1	3	5	
14	STOP		●							14	15	16			15	16	17	18	19	1	14	15	16	17	18	19	14												
15	PLAY ◁		●	●						14	15	16			15	16	17	18	20	2	14	15	16	17	18	20	14												
16	PLAY ▷		●		●					14	15	16			15	16	17	18	21	3	14	15	16	17	18	21	14												
17	FAST WINDING ◁◁		●				●			14	15	16			15	16	17	18	17	6	14	15	16	17	18	17	14												
18	FAST WINDING ▷▷		●					●		14	15	16			15	16	17	18	18	7	14	15	16	17	18	18	14												
19	PAUSE		●						●	14	20	21			20	21	17	18	14	8	14	20	21	17	18	14	14												
20	PLAY ◁ + PAUSE		●	●					●	14	20	21			20	21	17	18	15	9	14	20	21	17	18	15	14												
21	PLAY ▷ + PAUSE		●		●				●	14	20	21			20	21	17	18	16	10	14	20	21	17	18	16	14												

Memory works on fast winding
Mode works on slow winding
Timer works on mains connection

Alignment instructions motor electronic system

Test instruments and test cassettes required
1 wow meter
1 tape tension test cassette (KDW 231, item no. 232 797)
1 tape speed test cassette 3150 Hz

Take-up friction and tape speed

All trimmers set to centre position or pre-aligned.
Servicing plug in position "N" (normal mode)
Pitch control set to centre position (engaged)
Insert Sony TORQUE METER cassette
▶
Set tape tension to 50 ± 5 pcm with R 4524
◀
Tape tension must lie between 45 and 65 pcm.
Insert Dual cassette 3150 Hz.
▶
Set tape speed to ±0.5 % with R 4505.
Wow less than <0.1 %.
◀
Tape speed must be within the tolerance range of ±0.5 %
Wow less than <0.1 %.
Servicing plug in position "S" (servicing).
▶
Set tape speed to ±0.5 % with R 4503.
Wow less than <0.1 %.
◀
Tape speed must lie within the tolerance range of ±0.5 %.
Wow less than <0.1 %.
Servicing plug "N" (normal)

Alignment instructions analog section

Test instruments and test cassette required
2 millivoltmeters
1 AF oscillator
1 oscilloscope
1 frequency counter
1 test cassette 400 Hz −20 dB, 10 kHz −20 dB
1 test cassette Fe_2O_3 reference medium section, CrO_2 reference medium section
1 test cassette 400 Hz Dolby level 200 nWb/m

General notes
Before alignment, the magnetic head and all ferrous components contacting the tape must be demagnetised!

Realignment must be carried out in the sequence stated.

When aligning the coils, two core positions are possible. However, the outer core position should always be chosen.
Caution: the adjustment controls for the LED display must not be altered.

Playback

Level and LED modulation display
Set R 4035 and 4035' to fully counterclockwise position (when viewed from the front).
Apply the Dolby reference level (400 Hz).

Fe, ▶
Set a playback level of 580 mV ±0.25 dB while the Dolby reference signal tape is running, measured at MP 3 (left channel) and MP 3' (right channel)
Set track 1 (left channel) with R 4054
Set track 2 (right channel) with R 4054'
Set track 3 (left channel) with R 4052
Set track 4 (right channel) with R 4052'
Set the LED modulation displays to 0 dB while the Dolby reference signal tape is running.
For the left LED display, use R 4127
For the right LED display, use R 4127'

Magnetic head adjustment
Insert the test cassette section determined for gap adjustment (noise or 10 kHz).

Fe, ▶ (track 1–2) or ◀ (track 3–4)

With the set screw at the left, adjacent to the magnetic head, align for maximum voltage. Average the voltage at outputs L and R or switch both channels in parallel and align to maximum. Average the setting for both tape directions.

Frequency response
Insert the test cassette, section for determining frequency response (400 Hz −20 dB – 10 kHz −20 dB).

Fe, ▶ (track 1–2) or ◀ (track 3–4)
The output voltage at output L/R should be 0 dB with reference to 400 Hz.
With reference to 10 kHz = +4 to −3 dB
Deviations between channels at 10 kHz less than <3 dB.
When switching over to CrO_2 or FeCr, the 10 kHz level must be characterised by a voltage jump of −4 dB ±1 dB.

Background noise
Screened amplifier, ensure that the magnetic head is free of hum.
Insert the wow test cassette.
PAUSE, DOLBY, ▶ or ◀
Background noise at OUTPUT L/R less than <2 mV rms, measured with low-pass filter 20 Hz – 3 dB

RF generator
Preset R 4084, R 4084', R 4082 and R 4082' for RF biasing or set to centre position.
Measure the generator frequency with an absorption frequency meter near the erase head or with a frequency counter at the erase head via a 1 MΩ series resistor.
Set 105 kHz ±2 kHz with L 4100.
When switching over to Fe or FeCr, frequency deviation must not exceed a maximum of 2 kHz.

RF wave traps
Connect a thermionic voltmeter to test point 1 or test point 1' and align to minimum voltage (105 kHz) with L 4000 or L 4000'.
Maximum permissible difference of alignment in the other direction is 1/2 revolution.

Bias switching
The following voltage change must be measured with the aid of a capacitive voltage divider **at the** record/playback head, with reference to E_{HF} (105 kHz)

Fe	=	0 dB
Fe 1, FeCr	=	+2 dB ±0.5 dB
Cr 2, Cr	=	+4.5 dB ±0.5 dB
Met.	=	+8.5 dB ±0.5 dB

Erase head voltage
Measured at the erase head in position CrO_2 greater than >35 V≈

Recording
Connect AF oscillator to INPUT and amplifier, voltmeter and harmonic distortion meter to OUTPUT. Input switch to LINE.

RF biasing
Insert test cassette CrO_2 DIN reference medium section
CrO_2, RECORD, ▶ or ◀
Record 400 Hz and 10 kHz with −20 dB (LED display).
Compare levels on reproduction.
If there is no uniform level, correct RF biasing.
Decreased RF = treble emphasis
Increased RF = treble de-emphasis

Any changes of the RF level can be measured directly at the head via a capacitive voltage divider (1 pF coupling capacity), test point 2 or test point 2'.
For alignment of track 1 with R 4084
For alignment of track 2 with R 4084'
For alignment of track 3 with R 4082'
For alignment of track 4 with R 4082

Level
Insert CrO_2 DIN tape reference medium section.
RECORD, ▶ or ◀
Record 400 Hz at 0 dB (LED display) and then compare with playback level (LED display). If the levels are unequel, alter the record current until the playback level = record level.

Correction For track 1 use R 4062
For track 2 use R 4062'
For track 3 use R 4064'
For track 4 use R 4064

To check NF-recording currence, the NF voltage may be measured with filter on checkp. 1 and chekp. 2

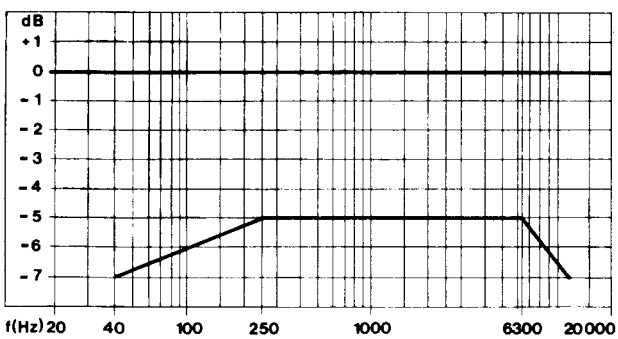
Harmonic distortion
When recording at 333 Hz with 0 dB level (LED display), harmonic distrotion K_3
must not exceed 2 % for Fe DIN tape and
must not exceed 3 % for CrO_2 DIN tape.

Erasure
RECORD, CrO_2, supply 1 kHz at 0 dB (LED display)
Erasure (measured selectively) greater than 62 dB

Limiter
Set R 4121 and R 4121' (on switchboard) to fully counterclockwise.
LIMITER ON, RECORD, ▶
Supply 400 Hz at the DIN input (+3 dB LED display). Slowly rotate R 4121 or 4121' clockwise until the LED displays indicate 0 dB.
When the voltage is briefly increased 10-fold (20 dB) at the input, it should take between 4 and 6 seconds (decay time) for the LED display to reach −10 dB.

Fade Edit
Insert a recorded cassette. Switch the tape selector switch to the relevant position. When FADE EDIT is operated, the level must fade out within 3 – 5 seconds and the tape must be fully erased after 10 seconds.
With the MPX filter switched off and FADE EDIT key depressed, set minimum voltage at the output using L 4002 and L 4002'.

Overall frequency responses
For Fe_2O_3 DIN tape and CrO_2 DIN tape, the overall frequency responses must be within the specified tolerances stipulated in DIN 45 500, sheet 4.
Recordings must be made at −26 dB (LED display). The units must meet the requirements of DIN 45 500, sheet 4 with Dolby NR.



Lower limiting frequency = 40 Hz, upper limiting frequency = 12.5 kHz
0.1 mNm = 1 pcm

Supply friction: (basic brake)

Left reel	0.8 – 1.2 mNm
Right reel	0.6 – 1 mNm (without counter belt)
	0.8 – 1.2 mNm (with counter belt)

Tape tension at the supply reel:
By means of slow braking of the reel in question (both directions) 7 mNm

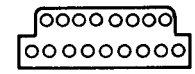
Braking the motor at end of tape:
During play or rapid wind/rewind, the motor must stop immediately when a wind spindle is braked.

Tape tension between the capstans:
The capstan leading at any time must run more quickly than the trailer capstan. (Tested by means of wow measurement – Dual cassette 3150 Hz).
Briefly brake the front pressure roller so that a tape loop is formed between the capstans. Tape speed must now measure 0.1 – 0.3 % higher than previously.

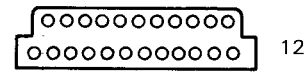
Static tests on C 839 tape drive

(Tape drive not connected)

		Test point	DC resistance ± 20 %
1.	**Magnetic heads**		
1.1.	**Record/playback head**	track 1	9/7 340 Ω
		track 2	6/4 340 Ω
		track 3	5/7 340 Ω
		track 4	8/4 340 Ω



1.2.	**Erase heads**	1/3	4.25 Ω
		2/3	4.25 Ω
2.	**Tape drive**		



2.1.	**Wind motor**	7/8	12/10.5 Ω *
			60/50 Ω *

At points 2.1 and 2.2., the motor must be turned over **very slowly** at 1 rpm and inspected for interruption (R ∞)

* This value must be measured 10 times per revolution of the motor at minimum angle of rotation.

2.3.	**Tacho generator**	11/1	ħ,7 Ω ± 40 %
2.4.	**Solenoids**		
	(Kaltwiderstand) = initial, cold resistance		
	M 4	2/6	30 Ω
	M 5	3/6	
2.5.	**Cassette compartment lighting**	6/⏚	20 – 60 Ω

2.6. **Safety levers/sensors**

	without cassette	with cassette	
Cassette sensor	12/1		
Record dafety lever 1	5/⏚	∞	< 0.2 Ω
Record safety lever 2	4/⏚		

2.7.	**Ground line**	Plug/rear printed circuit board	< 0.2 Ω

Safety regulations

Servicing work on electronic devices may only be carried out by trained personnel. During servicing, the device should be driven via an isolating transformer. The safety regulations stipulated in VDE 0860 H should always by observed.
Amongst other things, the design characteristics of the device must not be changed in a way which would reduce its safety (i.e. covering panels, mechanically secured lines, leakage paths and air gaps etc.). Replacement parts must be equivalent to original replacementparts and be correctly fitted. After repair work has been carried out, you must ensure that all exposed conductive sections carry no line voltage.

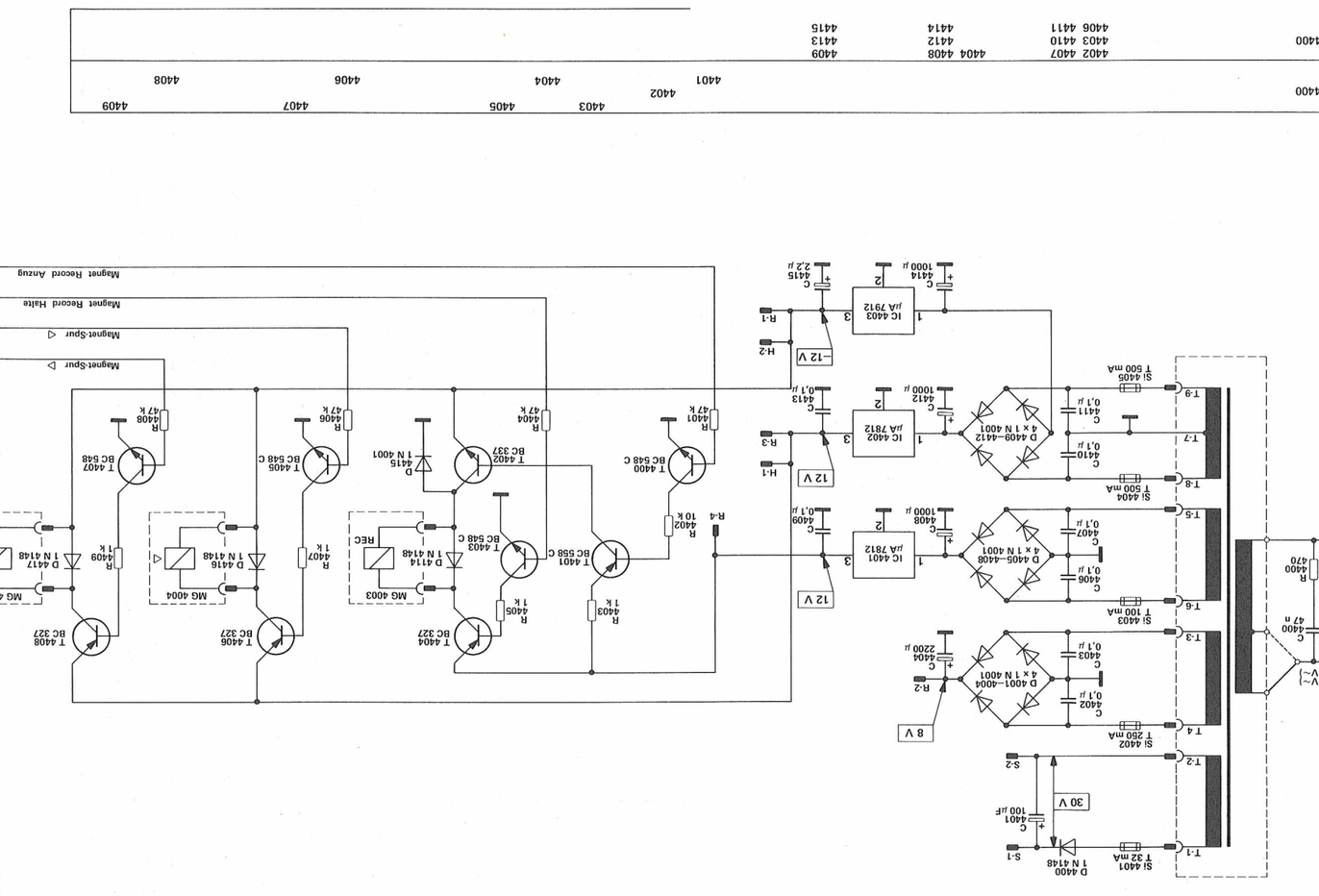
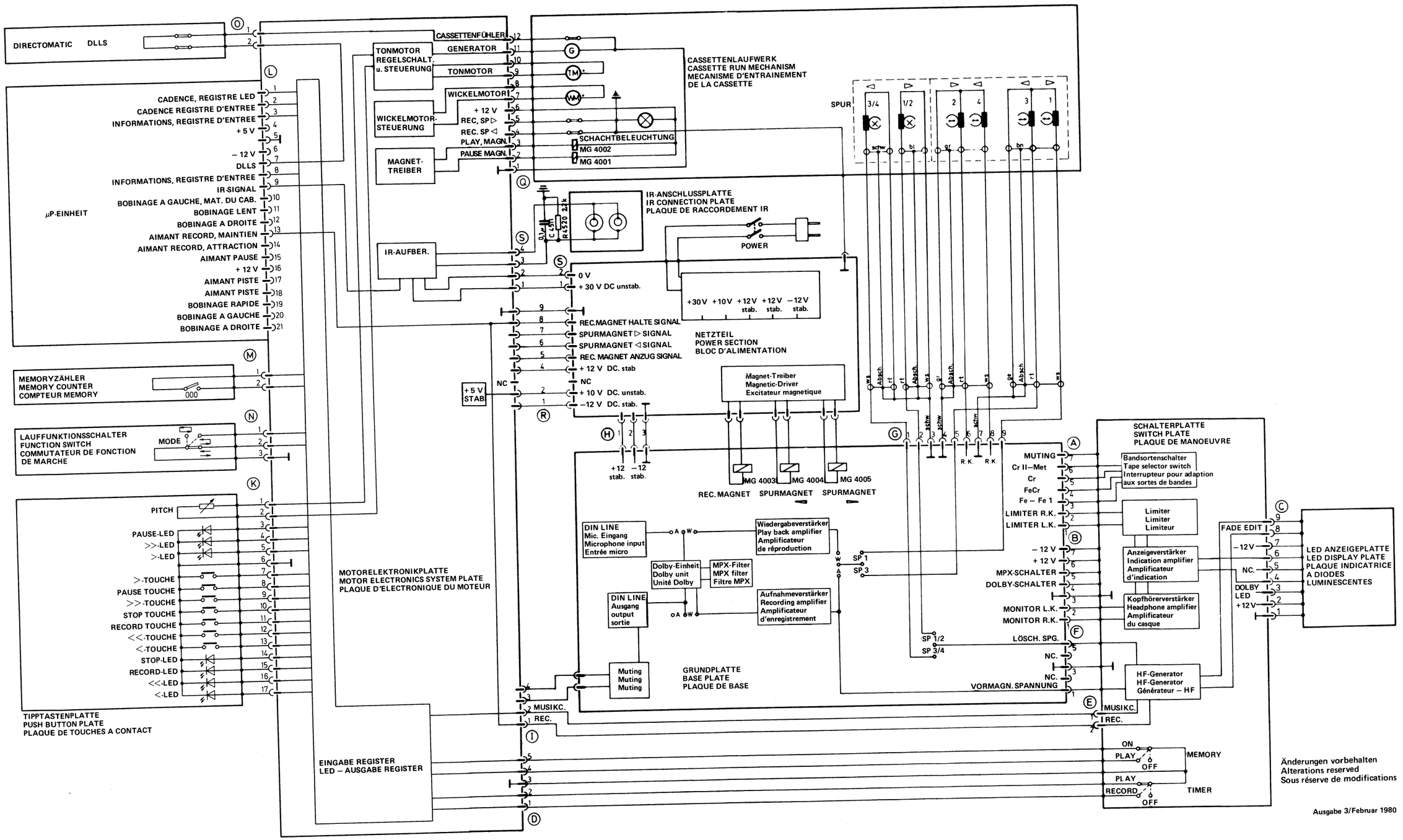


Fig. 1 Alignment positions

| | | |

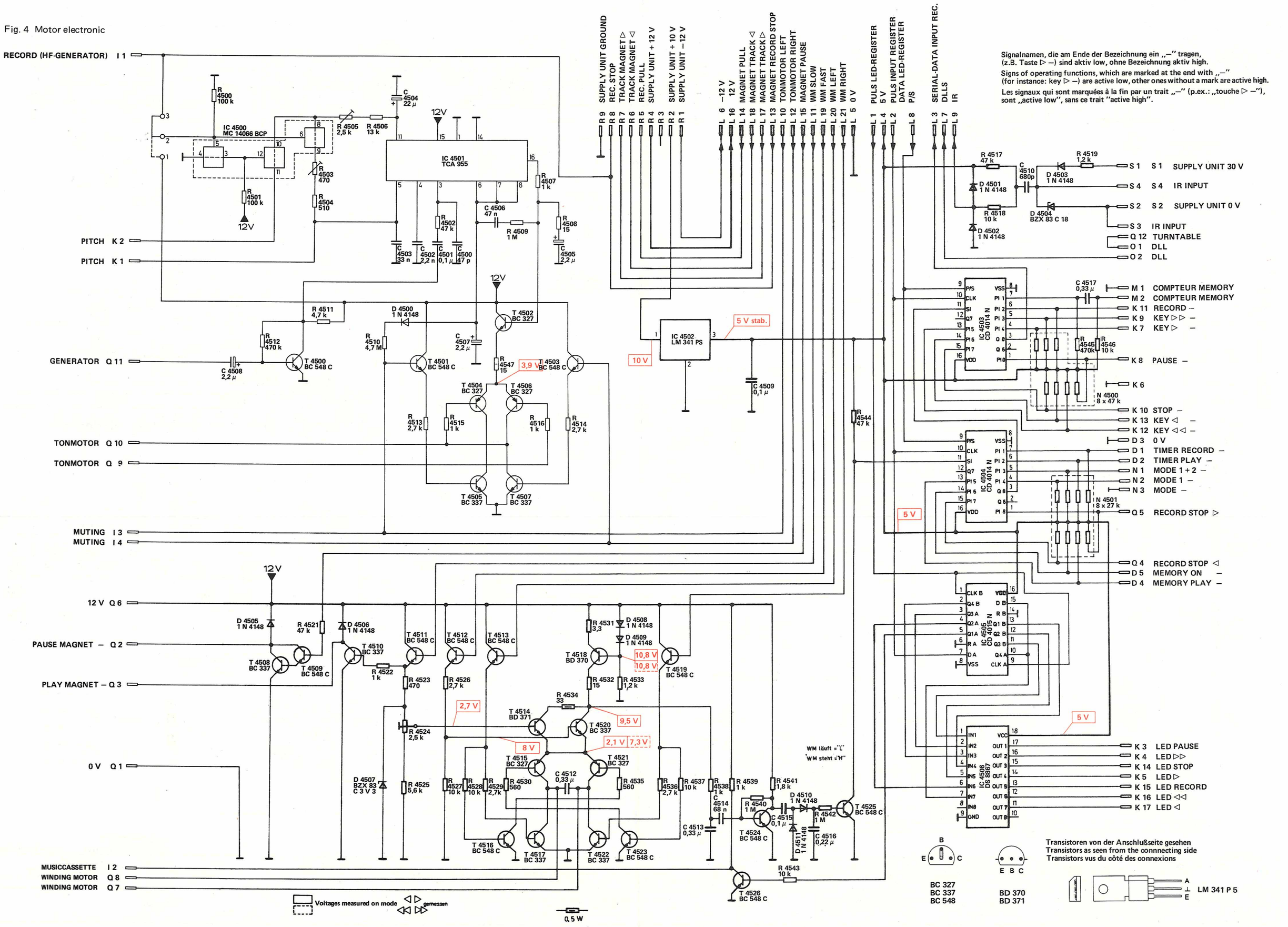
Fig. 3 Block diagram



Änderungen vorbehalten
Alterations reserved
Sous réserve de modifications

Ausgabe 3/Februar 1980

Fig. 4 Motor electronic



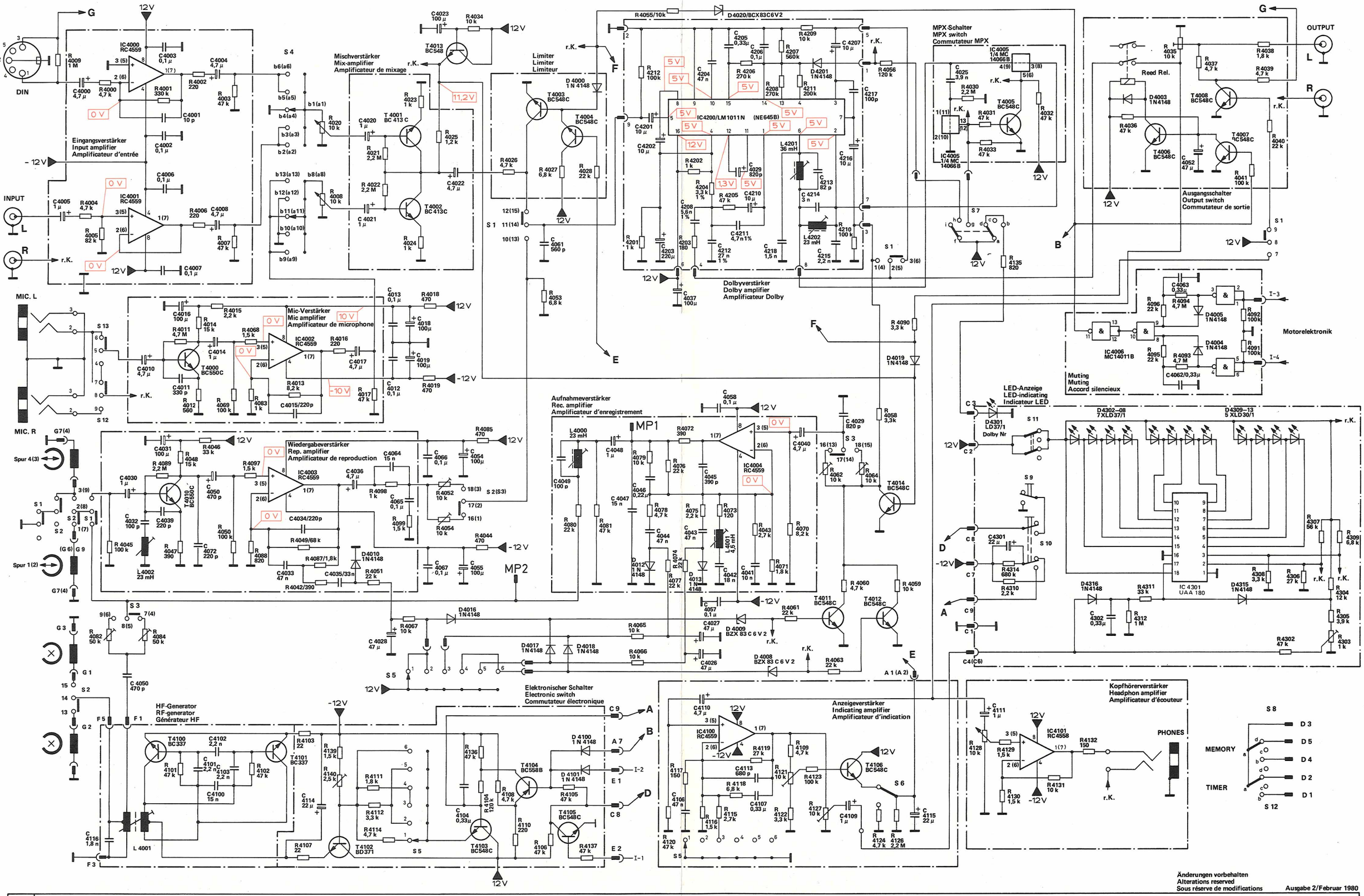
Signalnamen, die am Ende der Bezeichnung ein „–" tragen, (z.B. Taste ▷ –) sind aktiv low, ohne Bezeichnung aktiv high.

Signs of operating functions, which are marked at the end with „–" (for instance: key ▷ –) are active low, other ones without a mark are active high.

Les signaux qui sont marquées à la fin par un trait „–" (p.ex.: „touche ▷ –"), sont „active low", sans ce trait "active high".

Transistoren von der Anschlußseite gesehen
Transistors as seen from the connnecting side
Transistors vus du côté des connexions

Fig. 5 Wiring diagram analog part



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Alterations reserved
Sous réserve de modifications

Ausgabe 2/Februar 1980

R	4009 4004 4000 4011 4002 4014 4003 4008 4015 4013 4020 4008 4016 4020 4021 4023 4024 4025 4034 4026 4053 4037 4028 4212 4201 4055 4202 4203 4204 4206 4207 4208 4209 4211 5210 4056 4030 4031 4033 4032 4035 4037 4048 4038 4039 4005 4089 4048 4006 4012 4007 4050 4014 4068 4088 4097 4049 4042 4087 4017 4051 4098 4099 4018 4019 4085 4044 4080 4081 4079 4078 4076 4077 4072 4074 4075 4073 4043 4071 4109 4121 4070 4062 4064 4060 4058 4090 4059 4314 4310 4036 4096 4095 4094 4093 4091 4092 4306 4307 4309 4082 4084 4101 4046 4102 4107 4103 4139 4140 4111 4112 4114 4067 4136 4104 4108 4110 4106 4105 4137 4065 4066 4120 4117 4116 4115 4118 4119 4061 4122 4123 4127 4063 4124 4126 4128 4130 4129 4312 4311 4308 4302 4304 4305 4303
C	4005 4000 4002 4003 4001 4016 4004 4008 4015 4017 4020 4021 4013 4012 4018 4023 4022 4019 4061 4201 4202 4203 4208 4204 4205 4029 4206 4218 4213 4214 4207 4216 4217 4025 4052 4050 4010 4006 4007 4072 4050 4033 4034 4035 4036 4064 4065 4066 4067 4054 4055 4049 4048 4047 4037 4212 4211 4210 4058 4042 4041 4040 4029 4301 4063 4062 4116 4030 4032 4031 4039 4101 4102 4100 4103 4114 4028 4104 4106 4110 4026 4027 4057 4113 4107 4109 4115 4111 4131 4132 4302

Fig. 6 Base plate 262 451 equipment side

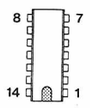
Transistoren von der Anschlußseite gesehen
Transistors as seen from the connecting side
Transistors vus du côté des connexions

BC 337
BC 413
BC 548
BC 550
BC 558

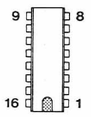
BD 371

IC's von der Bestückungsseite gesehen
IC's as seen from the top side
IC's vus du côté éléments

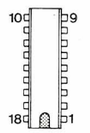
RC 4558
RC 4559



MC 14011 B



LM 1011



UAA 180

S 1 A/W-Schalter
S 2 Spurschalter
S 3 Spurschalter
S 4 Eingangswahlschalter
S 5 Bandsortenschalter
S 6 Limiter
S 7 Dolby MPX
S 8 Memory
S 9 Fade Edit
S 10 Fade Edit
S 11 Anzeige Ein/Aus
S 12 Timer

S 1 Rep/Play-switch
S 2 Track switch
S 3 Track switch
S 4 Input selector switch
S 5 Tape selector switch
S 6 Limiter
S 7 Dolby MPX
S 8 Memory
S 9 Fade-Edit
S 10 Fade-Edit
S 11 Indicating On/Off
S 12 Timer

S 1 ENR/Rep. commutateur
S 2 Trace commutateur
S 3 Trace commutateur
S 4 Selecteur d'entrée
S 5 Commutateur selecteur de bande
S 6 Limiter
S 7 Dolby MPX
S 8 Memory
S 9 Fade-Edit
S 10 Fade-Edit
S 11 Indicateur On/Off
S 12 Timer

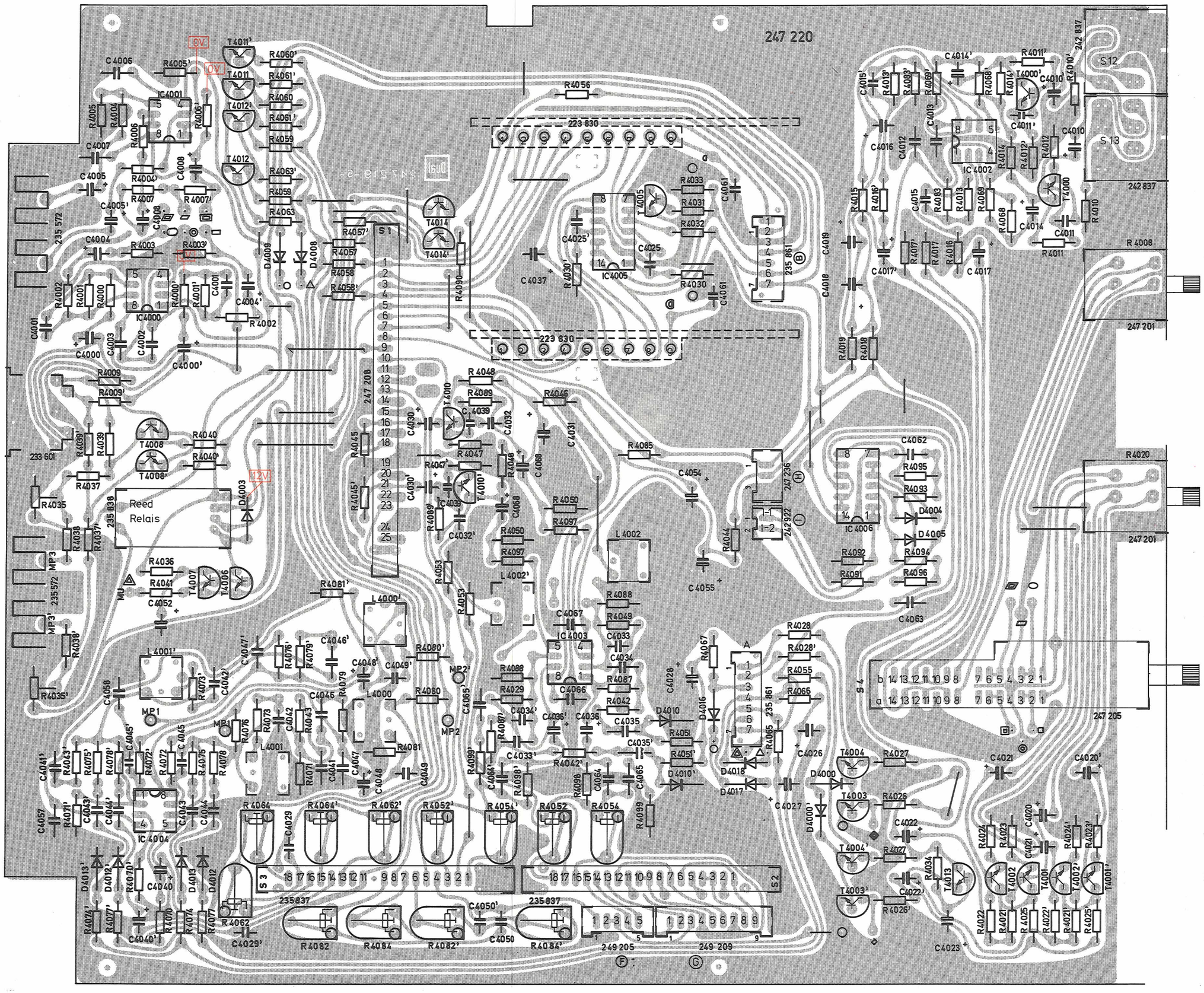


Fig. 7 Motor electronic 262 460 equipment side

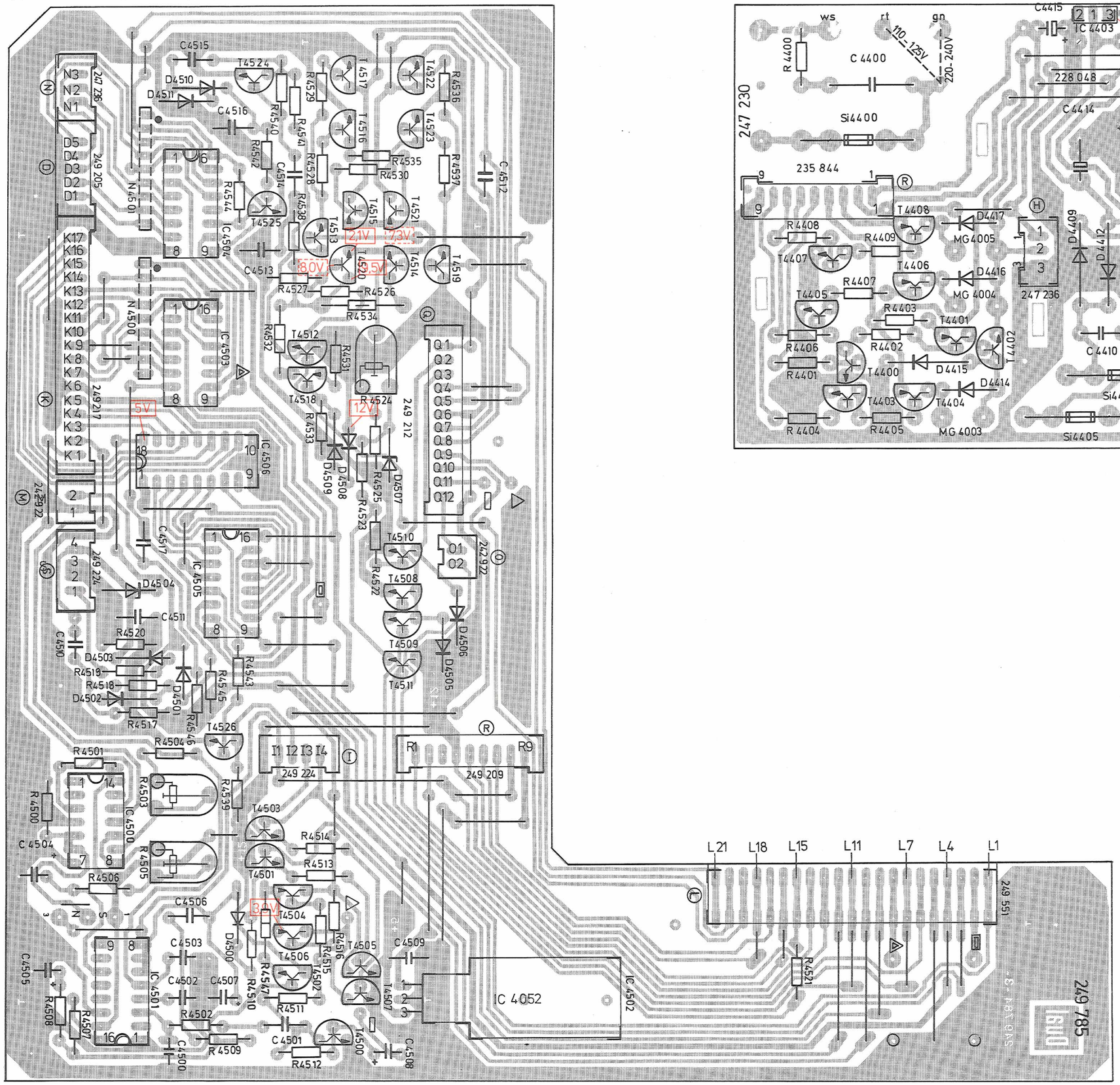


Fig. 8 Power part 262 461 equipment side

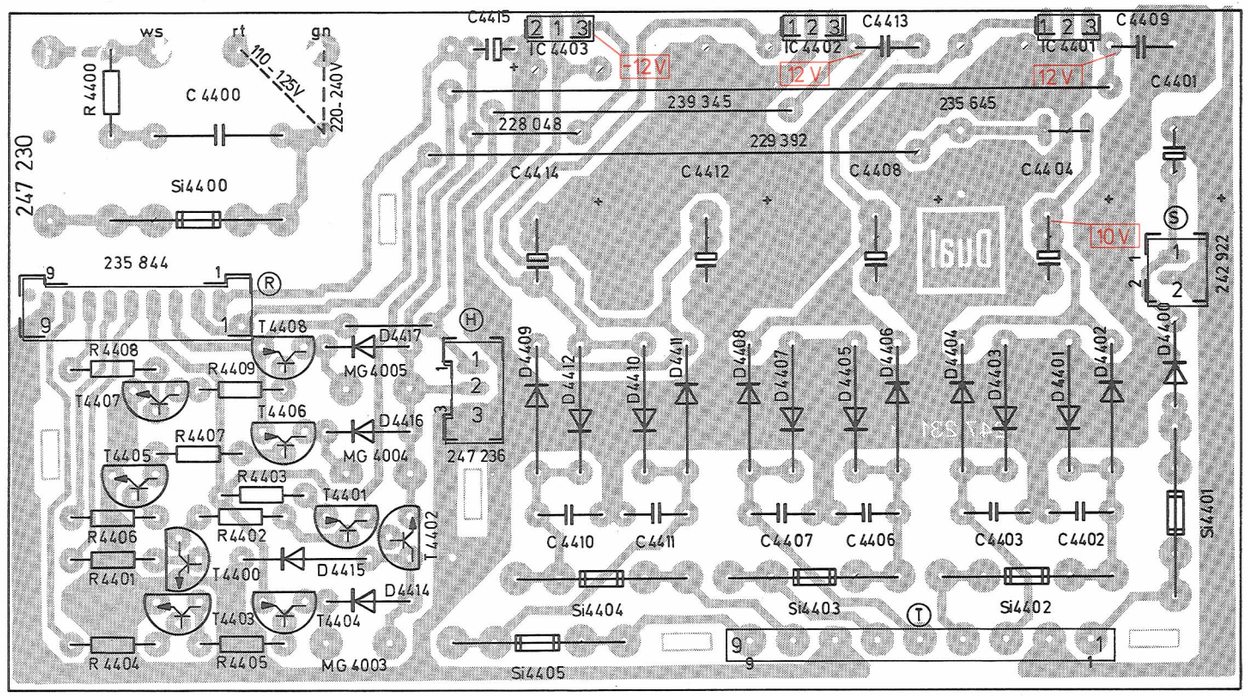


Fig. 9 Switch plate 262 464 equipment side

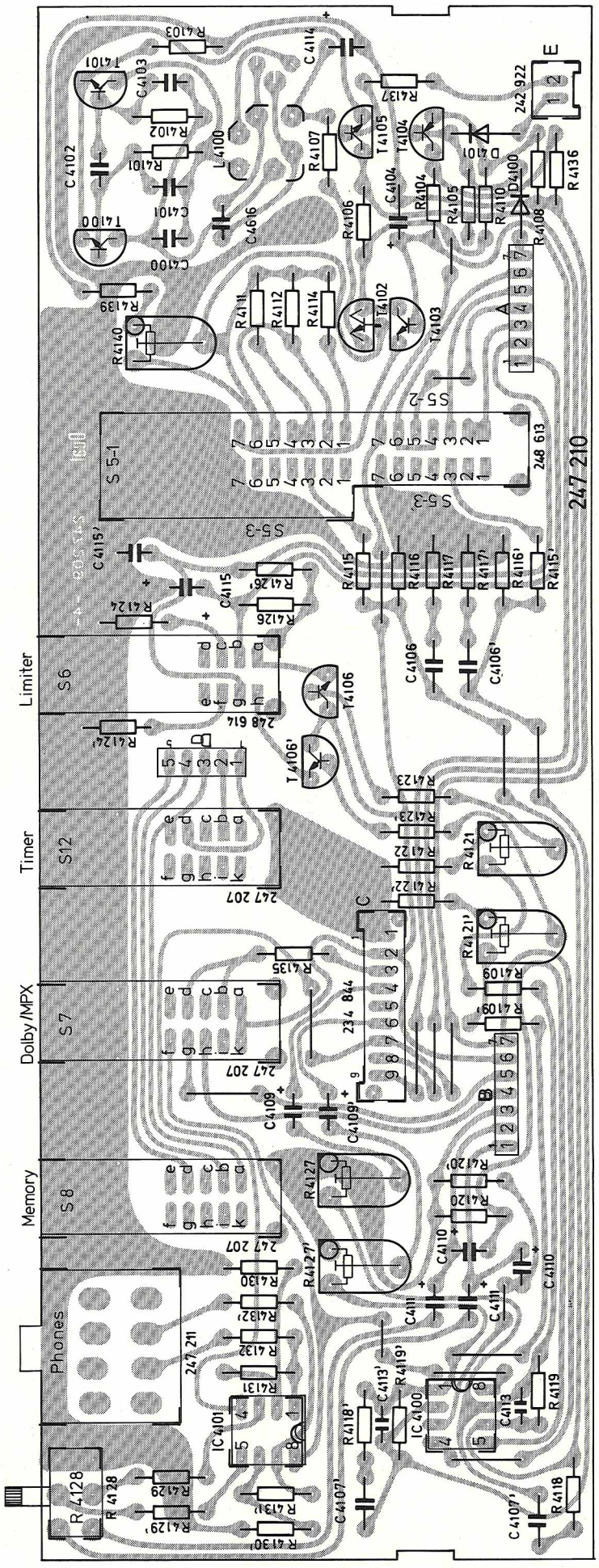


Fig. 10 LED-indicating 262 458 equipment side

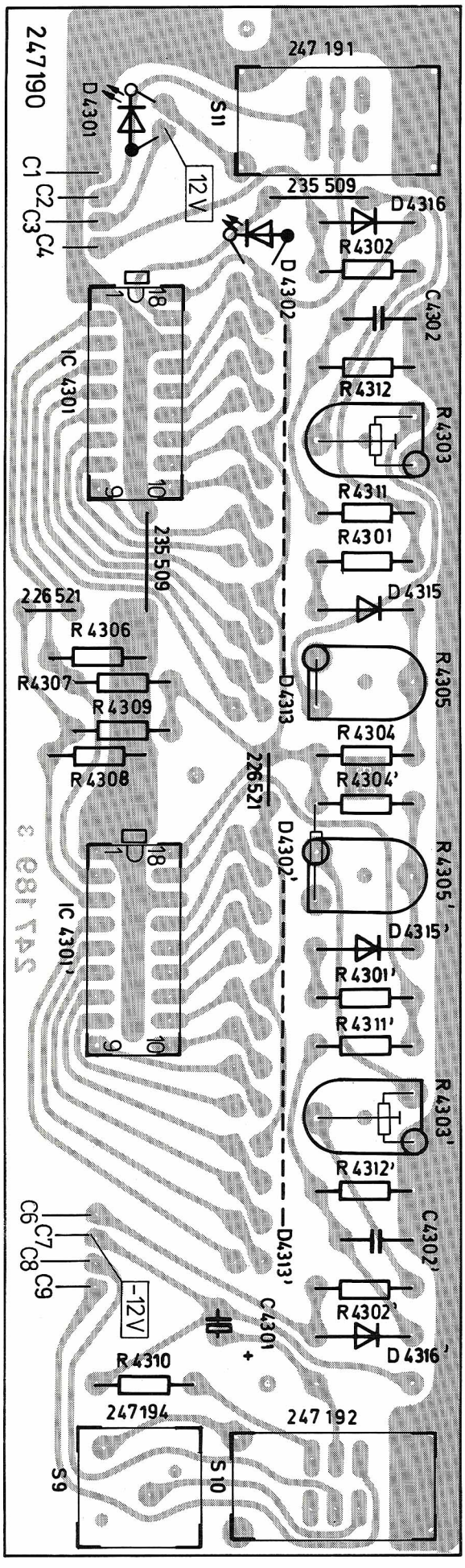


Fig. 11 Dolby amplifier 262 448 equipment side

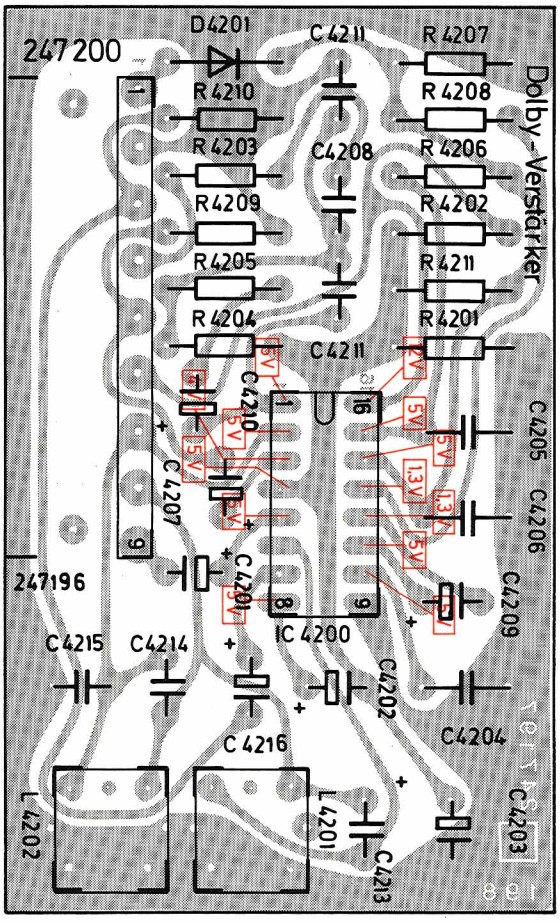
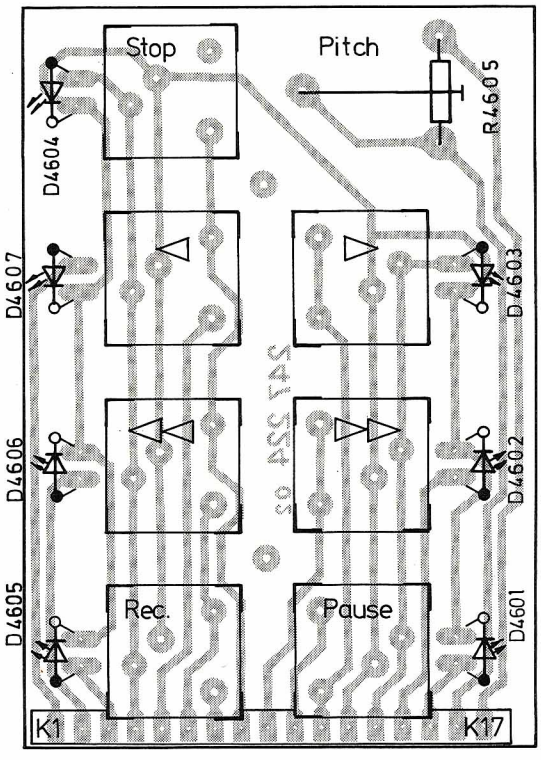


Fig. 12 Touch key plate 262 469 equipment side



Mechanical section

General information

The item numbers listed refer to the list of spare parts below and to the exploded diagrams. Before removing the various assemblies, the power switch must be switched off.
Removal or replacement of assemblies and adjustment.

1. **Top cover plate**

   Remove the two fillister-head self-tapping screws **114** at the rear of the unit and remove the top cover plate **113**.

2. **Bottom cover plate**

   Remove both fillister-head self-tapping screws **114** and the hexagonal self-tapping screw **98** at the base of the unit and remove the bottom cover plate **112**.

3. **Head cover plate**

   Loosen the two screws **78** and remove the complete head cover plate **77**.

4. **Frame together with stop keys, visor**

   Press the complete frame **75** to the right and left lightly to the centre and then remove it from below. Remove the frame, withdraw plug 0 from the motor electronic system. Withdraw the visor **50** from the front. When refitting, ensure that the bearing **42** is correctly positioned.

5. **Front trimplate**

   Remove the head cover and frame as described above. Remove all rotary switches, pushbuttons and the two lock washers **146**. Unscrew the 3 fillister-head self-tapping screws **114** from the base of the unit and then withdraw the front trimplate **100** from the front.

6. **Drive mechanism complete**

   Remove the cover plate, head cover and frame as described above. Remove the counter belt and withdraw the female multi-point connector Q from the motor electronics and G from the baseplate. Unscrew the 4 machine screws **135**, lift the drive mechanism approximately 10 cm, withdraw the black earth lead from the power section board and remove the drive mechanism from the top.

7. **Motors**

   When the drive mechanism has been removed, remove the 4 machine screws **3** and remove the cover panel. Remove the drive belt (capstan). Unscrew the 3 machine screws **25** and remove the motor fixture. Unscrew the machine screw **30**, remove the motor leads from the multi-point connector and wiring harness and then remove the motors.
   When refitting, ensure that the motors are correctly positioned (figure 14). The tape wind belt must be pressed downwards (refer to figure 15) through the tape wind motor drive pulley. Refitting involves the reverse procedure.

8. **Drive belts**

   Replacing capstan belts: refer to the description of the motors. Replacing the tape wind belt: remove the complete motor fixture by removing the 3 machine screws **25**. The tape wind belt should then be replaced (refer to figure 15).

9. **Flywheels**

   Note: flywheels must only be replaced in pairs. Remove the motor fixture as described in the section entitled "motor". Replace the flywheels. When refitting, ensure that the washers are replaced in the correct order (figure 16). Fit the flywheel using the adhesive magnetic ring at the right. The axial play of the flywheels, 0.2 – 0.5 mm, may be set at the screws **29**.

10. **Bulb** (cassette compartment lighting)

    Loosen the machine screw **32**, remove the retaining bracket and replace the bulb **34**.

Fig. 14

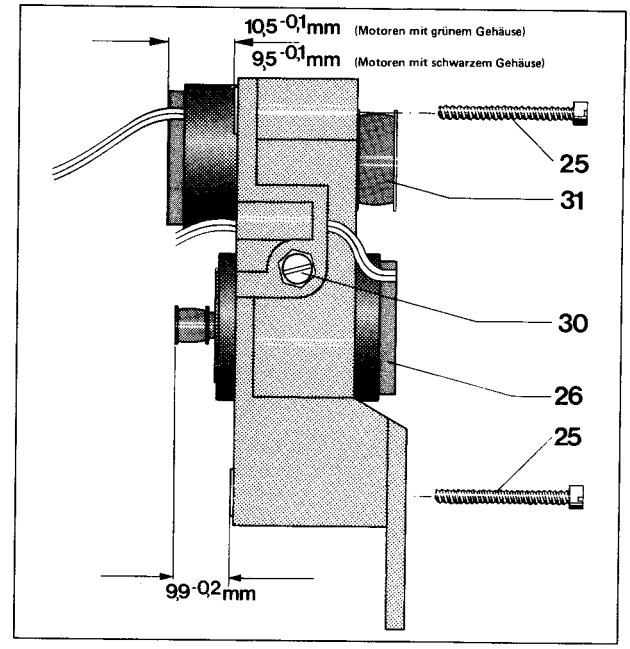


Fig. 15

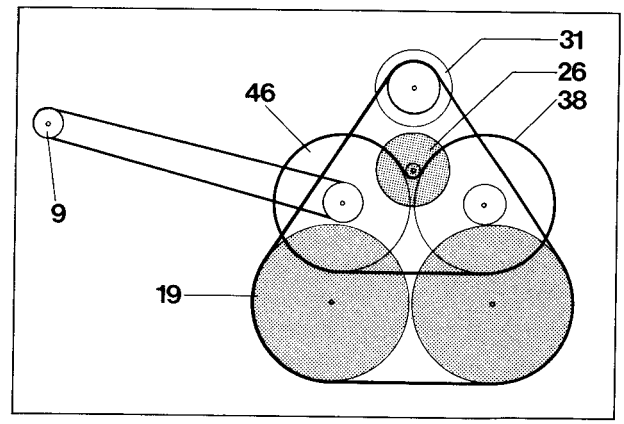
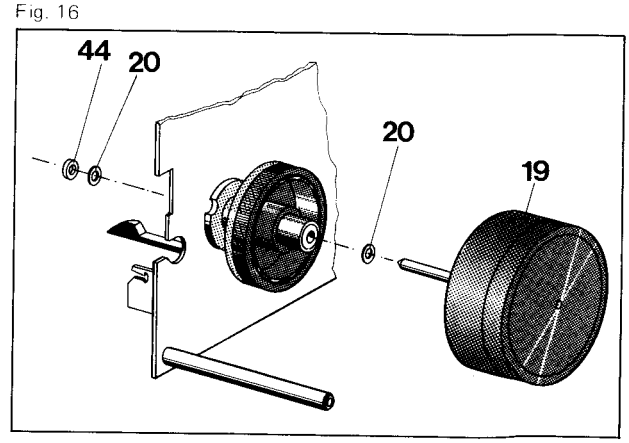


Fig. 16



11. Record/playback head

Remove the head cover **77** as described above. Solder off the leads to the head. Remove the screws **72** and **73** and spring **71** and then remove the record/playback head. Insert the new magnetic head. The screw at the right **72** must only be screwed in approximately 4 revolutions. Using the left screw, adjust the head so that the tape on a tape motion test cassette runs smoothly. Final adjustment must be carried out as described in the section entitled "electrical alignment".

12. Erase heads

Remove the head cover **77**. Erase heads **68** must only be replaced in pairs.

13. Magnets

With the drive mechanism removed from the unit, remove the 4 machine screws **3**. Remove the covering panel and withdraw the magnet fixture **12** by loosening the grip screws **10**. Remove grip screw **17** and unscrew the magnets.
When refitting the magnets ensure that magnet **4** at its stop position positions the head slide 0.75 ± 0.25 mm in front of its final position. Tighten magnet **5** so that the steel pin on the lever **15** deflexes the wire strap **62** 0.3 – 0.7 mm in its operating position.

14. Bearing flange for flywheels, drive pulleys

Remove the flywheels as described above. Unscrew the 4 machine screws **40** and remove the covering panel **49**.
Caution: do not twist the set of springs **35** on the record safety levers. Remove the relevant bearing flange or drive pulley after unscrewing the countersunk head screws **47**.
When refitting, take careful note of the description of the various assemblies. Recheck axial play of the flywheels and, if necessary, correct it to 0.2 – 0.5 mm.

15. Tape guide (up to unit no. 18000)

Remove the head cover **77** as described above. Remove the clamping ring **67** and the spacing pulley **66**. Raise the pressure roller together with tape guide approximately 1 mm and rotate it 1/4 revolution and then remove it from above (lift the cover slightly).
Tape guide synchronisation should be between 30 and 60 mN measured at the tape guide front edge. If necessary, bend the tape guide limb with a pair of flat-nose pliers. By bending both limbs by different amounts on each side, the height of the tape guide and, therefore, tape motion may be adjusted (figure 18).

16. Tape guide (from unit number 18001)

Unscrew the machine screw **M 2** and remove the complete tape guide fixture. Remove the adjustment bushing after removing the grub screw.
Remove the tape guide and pressure roller.
Adjust tape guide synchronisation to between 30 and 60 mN as described above.
Adjust the height of the tape guide for tape motion at the adjustment screw (the screw should afterwards by secured with locking lacquer).
The erase head tape guides use for aligning the guides flush serve as fixed reference points. The tape must not bend at any tape guide to such an extend that damage results.
Set the axial play of tape guide and pressure roller at the adjustment bushing (0.02 – 0.05 mm).

17. Take-up friction and tape speed

(Refer to alignment instructions for motor electronic system, page 7).

18. Cleaning/lubrication

Always clean the unit when servicing or repairing it. In order for the record/playback head **70** to function Properly, the erase heads **68**, the pressure rollers **65** and the capstan should always be kept in a perfectly clean condition.
We recommend the use of a cloth or cotton wool bud dipped in methylated spirit in order to clean these sections. Never use metal objects. The surface of the head must never be touched with bare hands.

Fig. 17

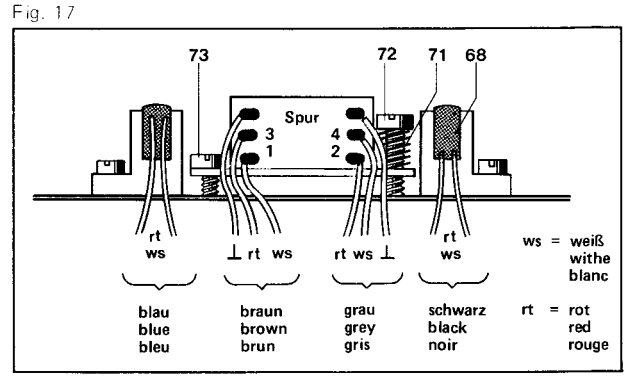
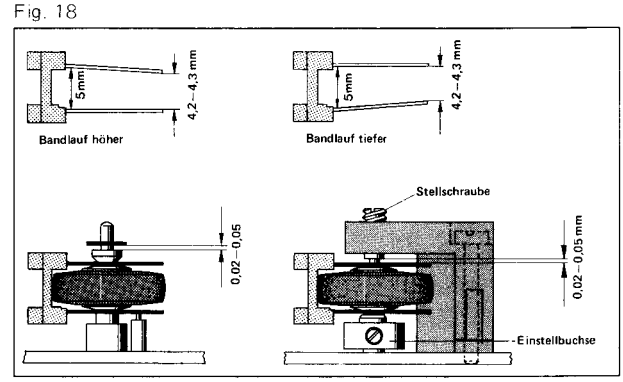


Fig. 18



All bearings and sliding points on the unit are adequately lubricated at the factory. Re-lubrication is normally not required for several years since the most important bearing points are provided with oil retainers. The motor bearings are designed as long-life oil retainers and, therefore, require no maintenance.

10 mN = 1 p

Lubrication chart (C 839 – drive mechanism)

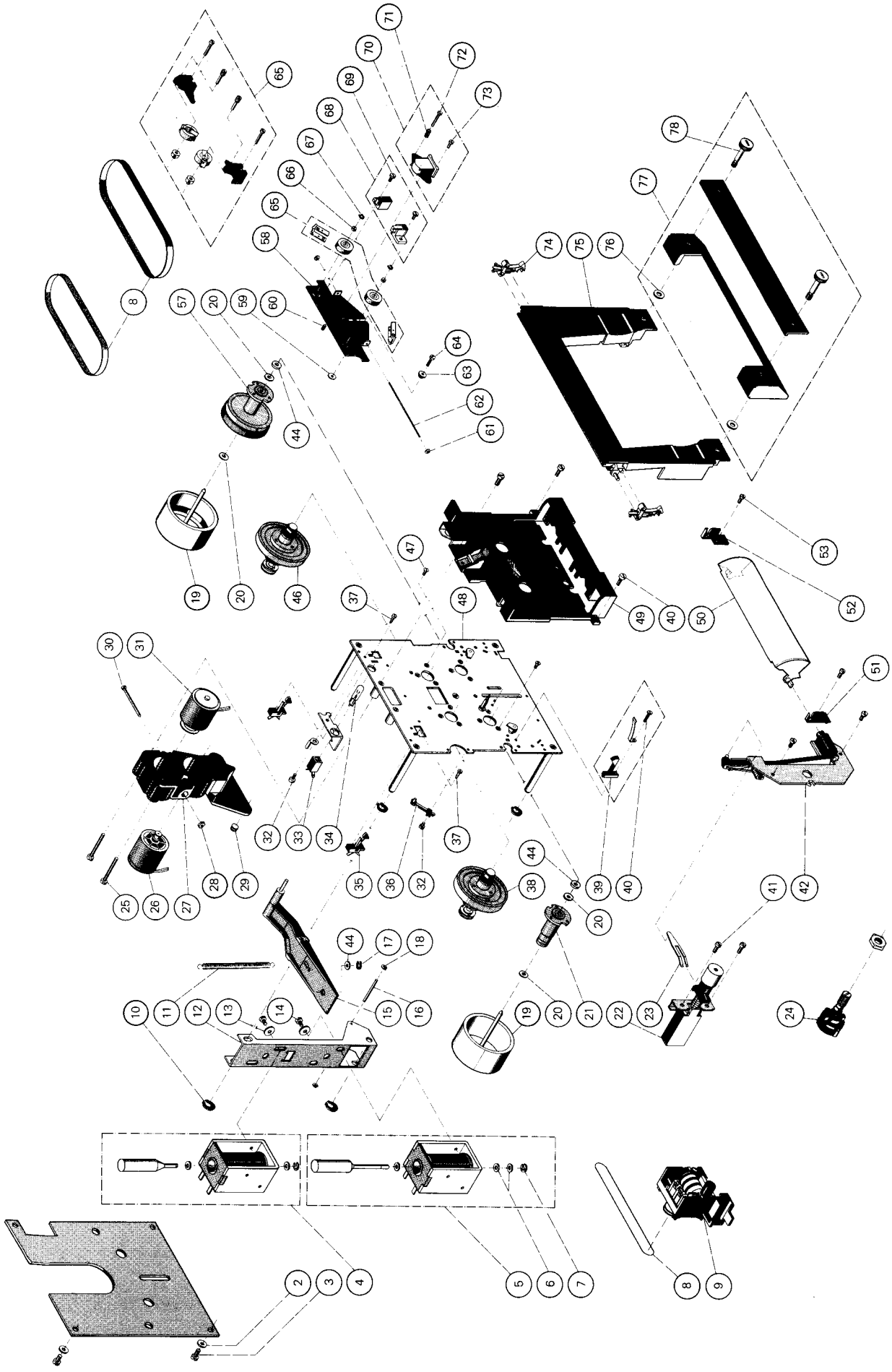
Lubrication points	lubricant
Flywheels (Capstans around bearings)	Isoflex PDP 40
Pressure rollers (with sintered bearings)	Isoflex PDP 40
(with synthetic bearings)	adhesive oil, Renotac
Head slide 3 guide slide bearings	Molykote paste
Levers	
Bearing in strap	adhesive oil, Renotac
Pin, points of contact with wire and head slide	adhesive oil, Renotac
Bearing surface of locking washers on magnet 5	adhesive oil, Renotac

Replacement parts

Pos.	Part.No.	Qty	Description
2	236 070	4	Machine screw M 2.5 x 6
3	237 518	4	Washer 2.7/6.5/0.5
4	262 452	1	Lift solenoid 1
5	262 453	1	Lift solenoid 2
6	210 597	5	Washer 3.2/7/0.5
7	210 145	2	Locking washer 2.3
8	262 475	1	Belt (set)
9	262 459	1	Memory counter complete
9	243 326	1	Knob
10	210 198	4	Seeger clamping ring 5 ϕ
11	262 170	1	Tension spring
12	262 166	1	Fixture
13	210 597	4	Washer 3.2/7/0.5
14	210 477	4	Machine screw M 3 x 5
15	262 198	1	Lever
16	262 161	1	Bearing needle 2 x 24.8
17	210 196	1	Seeger clamping ring 3 ϕ
18	210 194	2	Seeger clamping ring 2 ϕ
19	262 472	1	Flywheel
20	262 159	4	Washer 3.1/5/0.1
21	262 457	1	Bearing flange for left flywheel
22	260 267	1	Power switch complete 230 V
22	243 478	1	Power switch complete 115 V
23	243 444	1	Leaf spring
24	247 206	1	Motion function switch
25	262 157	3	Machine screw M 2.5 x 25
26	262 473	1	Motor (tape wind)
27	262 163	1	Motor fixture
28	210 353	1	Hexagonal nut M 2
29	262 201	2	Bearing bolt M 5
30	262 156	1	Machine screw M 2 x 25
31	262 474	1	Motor (capstan)
32	239 565	2	Machine screw M 2.5 x 3
33	262 162	1	Socket
34	209 443	1	Screw-in bulb
35	262 167	2	Set of springs (record safety lever)
36	262 168	1	Set of springs (cassette switch)
37	210 535	2	Countersunk head machine screw BZ 2.2 x 6.5
38	262 207	1	Left drive pulley complete
39	262 445	1	Support complete (set of two)
40	236 070	2	Machine screw M 2.5 x 6
41	210 485	5	Machine screw M 3 x 7
42	243 437	1	Bearing plate complete
44	262 160	3	Washer 2.8/6/1
46	262 443	1	Right drive pulley complete
47	210 376	12	Countersunk head screw M 2 x 5
48	262 197	1	Riveted circuit board
49	262 206	1	Cover plate complete
50	262 470	1	Visor
51	243 490	1	Left bearing bracket
52	243 491	1	Right bearing bracket
53	236 069	2	Machine screw M 2.5 x 4
57	262 456	1	Right bearing flange with tachogenerator
58	264 025	1	Head slide up to unit number 18000
58	264 571	1	Head slide from unit number 18001
59	210 555	1	Washer
60	262 479	2	DIN 553 grub screw M 2 x 4
61	262 480	1	Quick-lock locking washer
62	262 481	1	Spring clip
63	262 484	1	Guide bolt
64	210 434	1	Machine screw M 2 x 6
65	262 447	1	Tape guide complete (set of two)
65	264 501	1	Tape guide complete from unit no. 18001
65	264 500	2	Machine screw M 2 x 12
66	262 200	2	Spacing ring
67	217 602	2	Clamping ring
68	262 476	1	Erase heads (set of two)
69	211 361	2	Machine screw M 2 x 3
70	262 446	1	Record/playback head complete
71	262 204	1	Pressure spring
72	210 433	1	Machine screw M 2 x 8
73	228 783	1	Machine screw M 2 x 4
74	242 862	2	Microswitch
75	262 463	1	Frame complete (for locating cassette)
76	210 618	2	PS washer 3.7/8/0.5

Pos.	Part.No.	Qty	Description
77	262 455	1	Head cover complete
78	243 427	2	Screw
98	229 807	1	Hexagonal, self-tapping screw 2.9 x 16
100	262 450	1	Front trimplate (metallic silver)
100	262 449	1	Front trimplate (metallic brown)
101	243 432	1	Front panel
102	243 311	4	Damping strip
103	243 433	1	Rear panel
104	243 434	1	Side panel left
105	243 435	1	Side panel right
106	241 515	2	Rubber strip
107	218 043	8	Burnished wahser 3.2
108	243 096	8	Machine screw AM 3 x 8
109	244 101	2	Hexagonal self-tapping screw B 2.9 x 9.5
110	210 155	2	Tooth washer
111	229 816	4	Elastic buffer, grey
112	243 450	1	Bottom cover plate
113	243 425	1	Top cover plate
114	218 055	8	Burnished fillister-head self-tapping screw B 2.9 x 9.5
115	243 428	3	Toggle switch
116	243 431	1	Knob
117	245 972	4	Rocker switch
118	243 430	2	Rotating collar
119	243 429	2	Rotary switch
120	262 471	2	Pull magnet
121	210 469	6	Machine screw AM 3 x 3
122	243 449	1	Toggle lever complete
123	243 464	1	Lift magnet
124	243 459	1	Cover panel
125	262 465	1	Switch frame (jog switch panel)
126	243 458	1	Adjustment knob
127	262 444	1	Display frame complete (LED display)
128	243 454	1	Lift spring
129	243 455	1	Pushbutton
130	243 463	2	Dust shield
131	262 462	1	Power transformer complete
132	243 750	1	Power lead complete
132	232 995	1	UAP power lead
133	237 548	1	Cable entry
134	243 477	1	Infrared connection board
135	248 194	10	Machine screw M 2.5 x 10
136	210 487	3	Machine screw M 3 x 10
137	210 485	4	Machine screw AM 3 x 7
	210 472	4	Machine screw AM 3 x 4
	210 480	1	Machine screw AM 3 x 6
138	218 155	4	Hexagonal screw M 4 x 6
139	210 362	3	Hexagonal nut BM 3
140	227 467	22	Hexagonal self-tapping screw 2.9 x 6.5
141	227 470	5	Hexagonal self-tapping screw 2.9 x 9.5
142	228 529	3	Hexagonal self-tapping screw 3.5 x 9.5
143	227 443	7	Hexagonal screw 3.5 x 13
144	210 607	1	Washer 3.2/10/0.5
145	210 597	4	Washer 3.2/ 8/0.5
	249 443	4	Washer 7.2/12/1.2
146	210 146	2	Locking washer 3.2
147	235 319	2	Felt washer
148	260 212	5	Female multi-point connector 2pole
149	262 485	3	Female multi-point connector 3pole
150	260 213	2	Female multi-point connector 4pole
151	243 190	1	Female multi-point connector 5pole
152	243 191	2	Female multi-point connector 7pole
153	243 192	2	Female multi-point connector 9pole
154	245 776	1	Female multi-point connector 12pole
155	262 486	1	Female multi-point connector 17pole
156	240 861	9	Support
157	247 804	1	Circuit diagram
158	247 802	1	Operating instructions
	248 554	1	UAP operating instructions
159	262 487	1	Shipping carton complete
			Baseplate
200	262 451	1	Baseplate complete
201	233 601	1	Fitted jack 5pole
201	235 572	4	Fitted cynch jack
202	242 837	2	Microphone jack with nut
203	247 205	1	Rotary switch

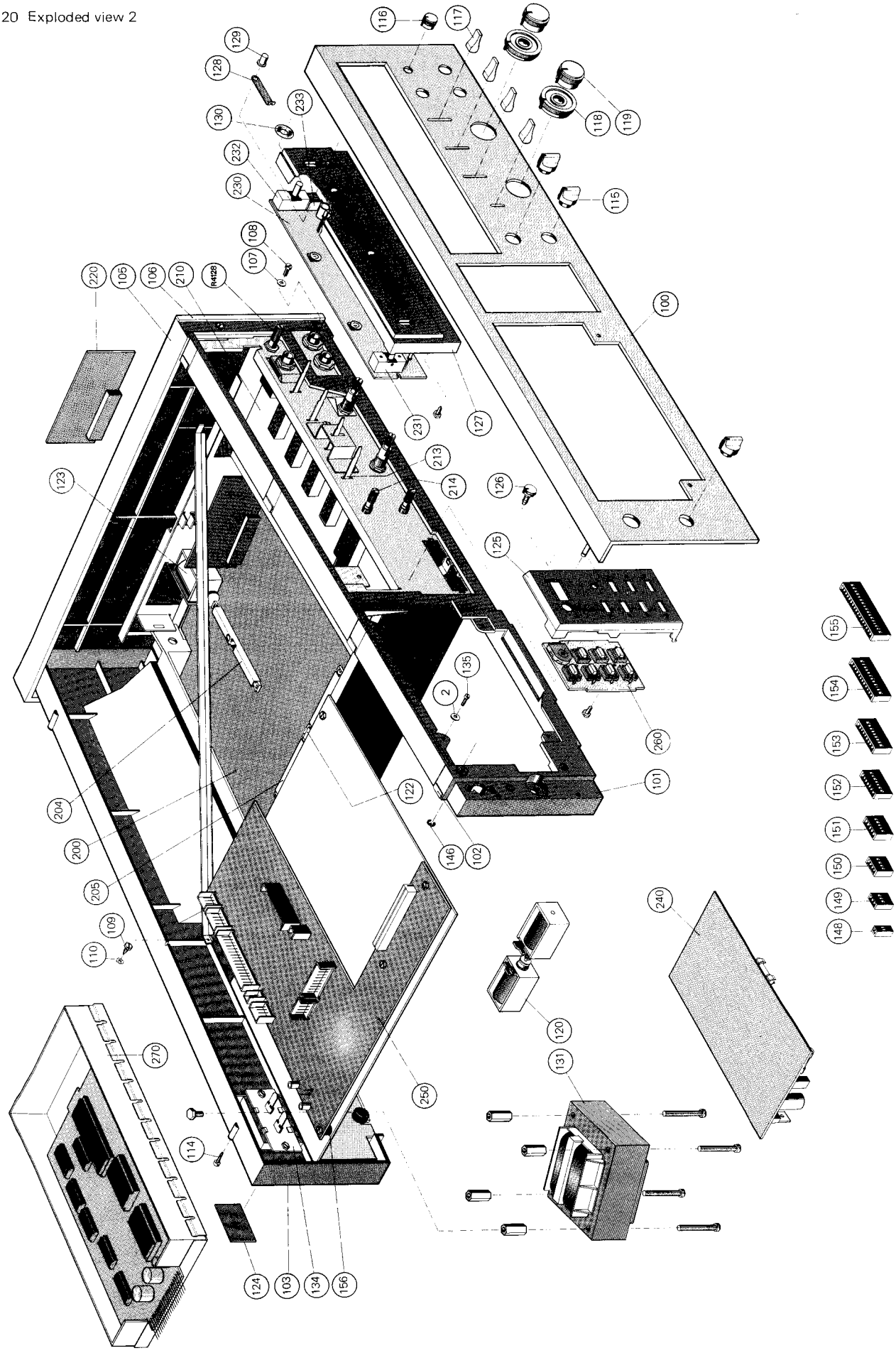
Fig. 19 Exploded view 1



Pos.	Part.No.	Qty	Description	
204	247 208	1	Switch	
205	235 837	2	Switch	
206	235 838	1	Reed relay	
D 4000	223 906	14		1 N 4148
D 4003	223 906	14		1 N 4148
D 4004	223 906	14		1 N 4148
D 4005	223 906	14		1 N 4148
D 4008	226 725	2		BZX 83 C 6 V 2
D 4009	226 725	2		BZX 83 C 6 V 2
D 4010	223 906	14		1 N 4148
D 4012	223 906	14		1 N 4148
D 4013	223 906	14		1 N 4148
D 4016	223 906	14		1 N 4148
D 4017	223 906	14		1 N 4148
D 4018	223 906	14		1 N 4148
L 4000	235 517	2	Coil	
L 4001	235 533	2	Coil	
L 4002	235 517	2	Coil	
R 4008	247 201	2	Potentiometer (input)	
R 4020	247 201	2	Potentiometer (input)	
R 4035	242 846	2	Trimmer	10 kΩ lin.
R 4052	226 498	8	Trimmer	10 kΩ lin.
R 4054	226 387	8	Trimmer	10 kΩ lin.
R 4062	226 498	8	Trimmer	10 kΩ lin.
R 4064	226 498	8	Trimmer	10 kΩ lin.
R 4082	229 911	4	Trimmer	50 kΩ lin.
R 4084	229 911	4	Trimmer	50 kΩ lin.
T 4000	226 898	4		BC 550 C
T 4001	226 825	4		BC 413 C
T 4002	226 825	4		BC 413 C
T 4003	244 715	16		BC 548 C
T 4004	244 715	16		BC 548 C
T 4005	244 715	16		BC 548 C
T 4006	244 715	16		BC 548 C
T 4007	244 715	16		BC 548 C
T 4008	244 715	16		BC 548 C
T 4010	226 898	4		BC 550 C
T 4011	244 715	16		BC 548 C
T 4012	244 715	16		BC 548 C
T 4013	244 715	16		BC 548 C
T 4014	244 715	16		BC 548 C
IC 4000	247 866	4		RC 4559 DN
IC 4001	247 866	4		RC 4559 DN
IC 4002	247 866	4		RC 4559 DN
IC 4003	247 866	4		RC 4559 DN
IC 4004	236 299	1		RC 4558 DN
IC 4005	261 871	1	▲	MC 14066 BCP
IC 4006	240 843	1	▲	MC 14011 BCP
			Switch panel	
210	262 464	1	Switch panel complete	
211	247 211	1	Coaxial jack	
212	247 207	3	Toggle switch	
213	248 614	1	Toggle switch (limiter)	
214	248 613	1	Rotary switch	
D 4100	223 906	2	Diode	1 N 4148
D 4101	223 906	2	Diode	1 N 4148
L 4100	249 782	1	Generator coil	
R 4121	226 498	4	Trimmer	10 kΩ lin.
R 4127	226 498	4	Trimmer	10 kΩ lin.
R 4140	238 092	1	Trimmer	2.5 kΩ lin.
T 4100	220 537	2		BC 337/16
T 4101	220 537	2		BC 337/16
T 4102	247 241	1		BD 371 A
T 4103	244 715	4		BC 548 C
T 4104	240 787	1		BC 558 B
T 4105	244 715	4		BC 548 C
T 4106	244 715	4		BC 548 C
IC 4100	236 299	2		RC 4558 DN
IC 4101	236 299	2		RC 4558 DN
R 4128	247 204	1	Trimmer	10 kΩ lin.

Pos.	Part.No.	Qty	Description	
			Dolby amplifier	
220	262 448	1	Dolby amplifier complete	
221	235 574	1	Integrated cirrcuit mount	16pole
D 4201	223 906	1	Diode	1 N 4148
L 4201	235 516	1	Coil	10 PA
L 4202	235 517	1	Coil	10 PA
IC 4200	247 195	1		LM 1011 N
			LED display	
230	262 458	1	LED panel complete	
231	247 191	1	Switch	ON/OFF
232	247 192	1	Switch	FADE EDIT
233	247 194	1	Pushbutton	
D 4301	235 851	15		LED 37/I green
D 4302	235 851	15		LED 37/I green
D 4303	235 851	15		LED 37/I green
D 4304	235 851	15		LED 37/I green
D 4305	235 851	15		LED 37/I green
D 4306	235 851	15		LED 37/I green
D 4307	235 851	15		LED 37/I green
D 4308	235 851	15		LED 37/I green
D 4309	235 852	10		LED 30/I red
D 4310	235 852	10		LED 30/I red
D 4311	235 852	10		LED 30/I red
D 4312	235 852	10		LED 30/I red
D 4313	235 852	10		LED 30/I red
D 4315	223 906	4		1 N 4148
D 4316	223 906	4		1 N 4148
R 4303	227 265	2	Trimmer	1 kΩ lin.
IC 4301	235 848	2		UAA 180
			Power section	
240	262 461	1	Power section board complete	
C 4404	262 418	1		2200 µF
D 4400	223 906	4	Diode	1 N 4148
D 4401	227 344	13	Diode	1 N 4001
D 4402	227 344	13	Diode	1 N 4001
D 4403	227 344	13	Diode	1 N 4001
D 4404	227 344	13	Diode	1 N 4001
D 4405	227 344	13	Diode	1 N 4001
D 4406	227 344	13	Diode	1 N 4001
D 4407	227 344	13	Diode	1 N 4001
D 4408	227 344	13	Diode	1 N 4001
D 4409	227 344	13	Diode	1 N 4001
D 4410	227 344	13	Diode	1 N 4001
D 4411	227 344	13	Diode	1 N 4001
D 4412	227 344	13	Diode	1 N 4001
D 4414	223 906	4	Diode	1 N 4148
D 4415	227 344	13	Diode	1 N 4001
D 4416	223 906	4	Diode	1 N 4148
D 4417	223 906	4	Diode	1 N 4148
T 4400	244 715	4		BC 548 C
T 4401	240 787	1		BC 558 B
T 4402	226 870	1		BC 337/25
T 4403	244 715	4		BC 548 C
T 4404	220 538	3		BC 327/16
T 4405	244 715	4		BC 548 C
T 4406	220 538	3		BC 327/16
T 4407	244 715	4		BC 548 C
T 4408	220 538	3		BC 327/16
SI 4401	248 304	1	G-fuse	T 32 mA
SI 4402	209 697	1	G-fuse	T 250 mA
SI 4403	248 305	1	G-fuse	T 1 mA
SI 4404	209 698	1	G-fuse	T 0.5 mA
SI 4405	209 698	1	G-fuse	T 0.5 mA
IC 4401	247 242	2		IC MC 7812 CT
IC 4402	247 242	2		IC MC 7812 CT
IC 4403	247 244	1		IC MC 7912 CT
			Motor electronic system	
250	262 460	1	Motor electronics complete	

Fig. 20 Exploded view 2



Pos.	Part.No.	Qty	Description	
D 4500	223 906	10		1 N 4148
D 4501	223 906	10		1 N 4148
D 4502	223 906	10		1 N 4148
D 4503	223 906	10		1 N 4148
D 4504	248 432	1		BZX 83 C 18
D 4505	223 906	10		1 N 4148
D 4506	223 906	10		1 N 4148
D 4507	209 840	1	Zener diode	ZG 3.3
D 4508	223 906	10		1 N 4148
D 4509	223 906	10		1 N 4148
D 4510	223 906	10		1 N 4148
D 4511	223 906	10		1 N 4148
N 4500	248 791	2	Resistor network	8 x 47 kΩ
N 4501	248 791	2	Resistor network	8 x 47 kΩ
R 4503	249 788	1	Trimmer	470 kΩ/lin.
R 4505	248 426	1	Trimmer	2.5 kΩ/lin.
R 4524	235 543	1	Trimmer	2.5 kΩ/lin.
T 4500	244 715	13	Transistor	BC 548 C
T 4501	244 715	13	Transistor	BC 548 C
T 4502	220 537	7	Transistor	BC 337/16
T 4503	244 715	13	Transistor	BC 548 C
T 4504	220 538	4	Transistor	BC 327/16
T 4505	220 537	7	Transistor	BC 337/16
T 4506	220 538	4	Transistor	BC 327/16
T 4507	220 537	7	Transistor	BC 337/16
T 4508	220 537	7	Transistor	BC 337/16
T 4509	244 715	13	Transistor	BC 548 C
T 4510	220 537	7	Transistor	BC 337/16
T 4511	244 715	13	Transistor	BC 548 C
T 4512	244 715	13	Transistor	BC 548 C
T 4513	244 715	13	Transistor	BC 548 C
T 4514	247 241	1	Transistor	BD 371 A
T 4515	220 538	4	Transistor	BC 327/16
T 4516	244 715	13	Transistor	BC 548 C

▲ Caution! Highly-sensition MOS components

Pos.	Part.No.	Qty	Description	
T 4517	220 537	7	Transistor	BC 337/16
T 4518	260 256	1	Transistor	BD 370 A
T 4519	244 715	13	Transistor	BC 548 C
T 4520	220 537	7	Transistor	BC 337/16
T 4521	220 538	4	Transistor	BC 327/16
T 4522	220 537	7	Transistor	BC 337/16
T 4523	244 715	13	Transistor	BC 548 C
T 4524	244 715	13	Transistor	BC 548 C
T 4525	244 715	13	Transistor	BC 548 C
T 4526	244 715	13	Transistor	BC 548 C
IC 4500	261 871	1	▲	MC 14066 BCP
IC 4501	248 424	1		TVA 955
IC 4502	248 425	1		LM 341 P–5.0
IC 4503	263 374	1		CD 4014 CN
IC 4504	263 374	1	▲	CD 4014 CN
IC 4505	263 373	1	▲	CD 4015 CN
IC 4506	248 423	1	▲	DS 8867 N
			Jog switch panel	
260	262 469	1	Jog switch panel complete	
261	243 470	7	Jog switch	
D 4601	235 851	1	green	LED 37/1
D 4602	235 853	4	yellow	LED 35/1
D 4603	235 853	4	yellow	LED 35/1
D 4604	235 852	2	red	LED 30/1
D 4605	235 852	2	red	LED 30/1
D 4606	235 853	4	yellow	LED 35/1
D 4607	235 853	4	yellow	LED 35/1
R 4605	247 243	1	Trimmer	1.5 kΩ/10 %
			Control electronic system	
270	265 615	1	Control electronics board complete up to unit number 14000	
270	262 468	1	Control electronics board complete as from unit number 14001	

Subject to modification